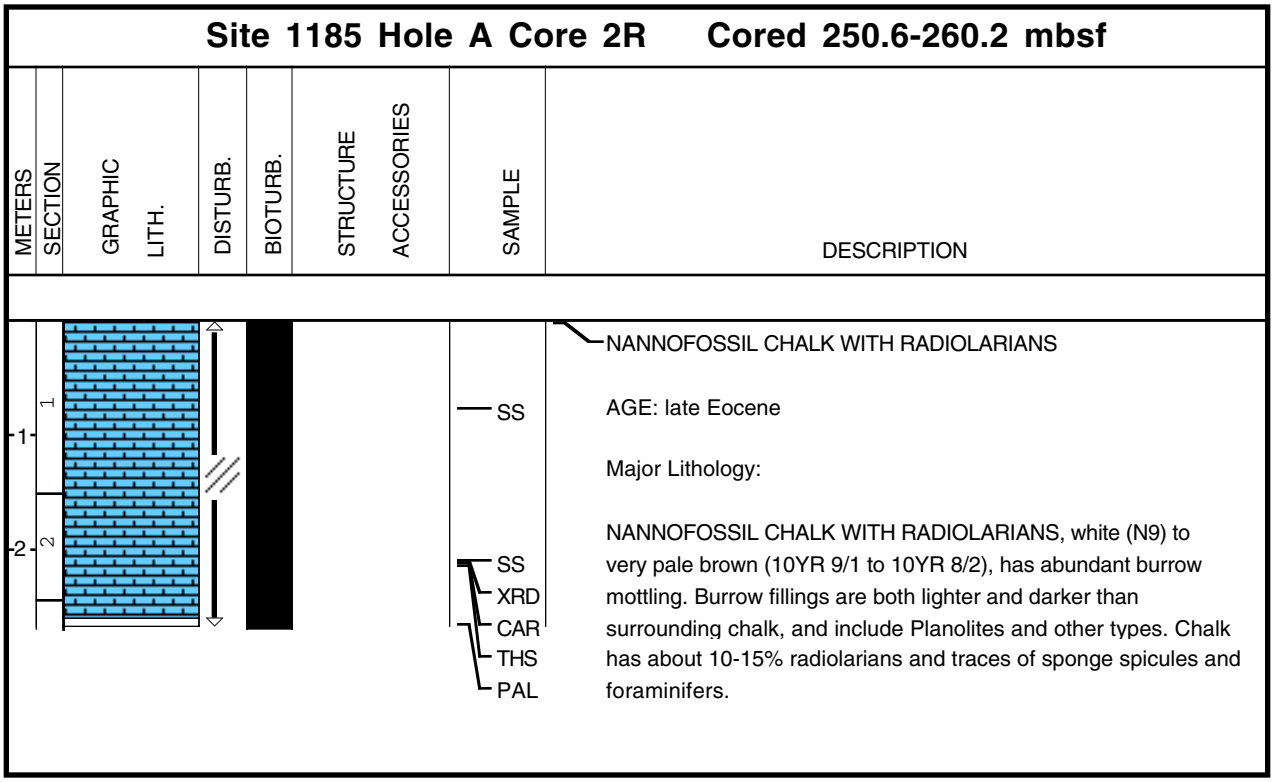
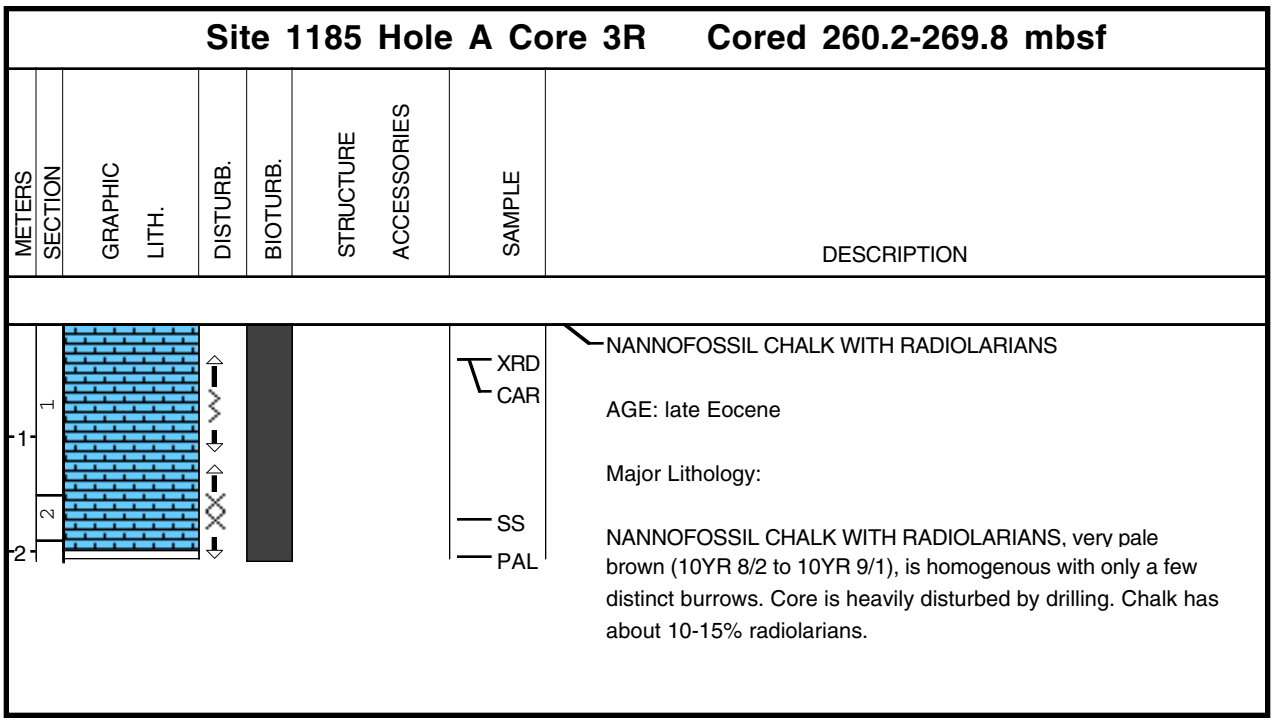
Core Photo

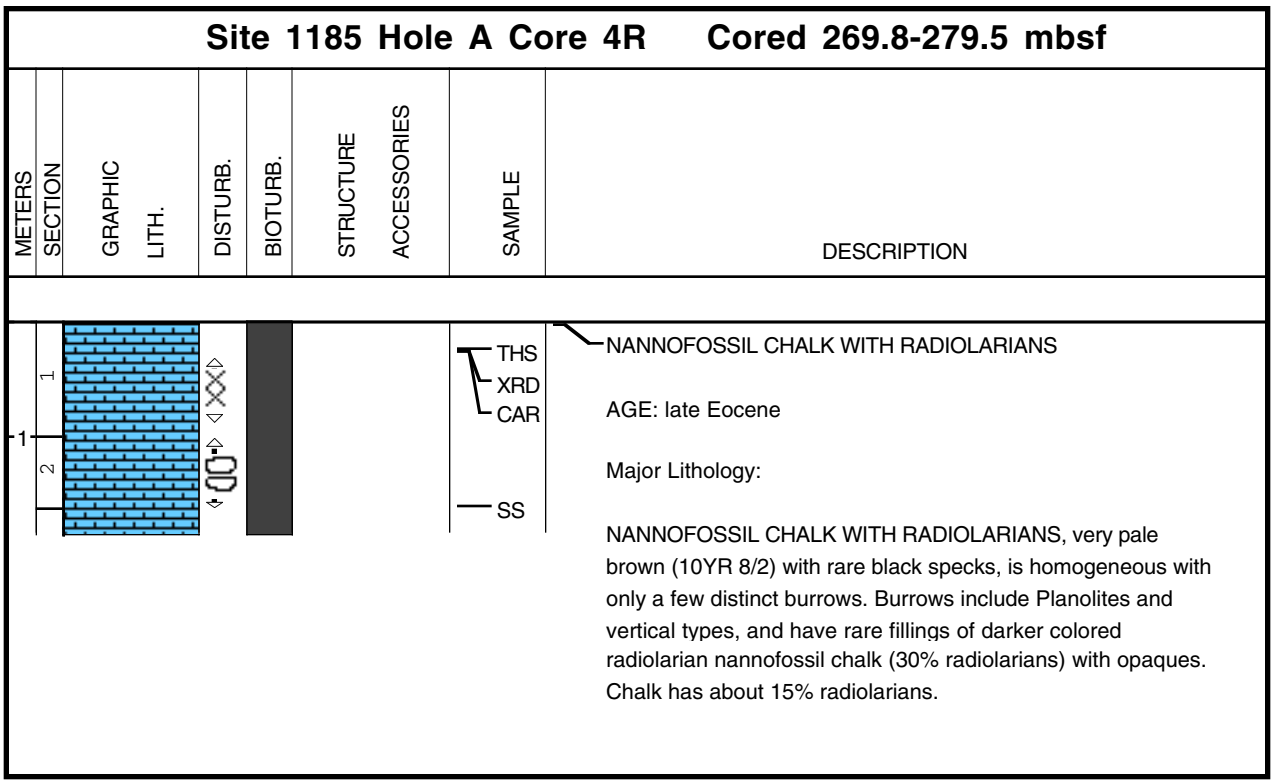
1185A-1W WASH CORE



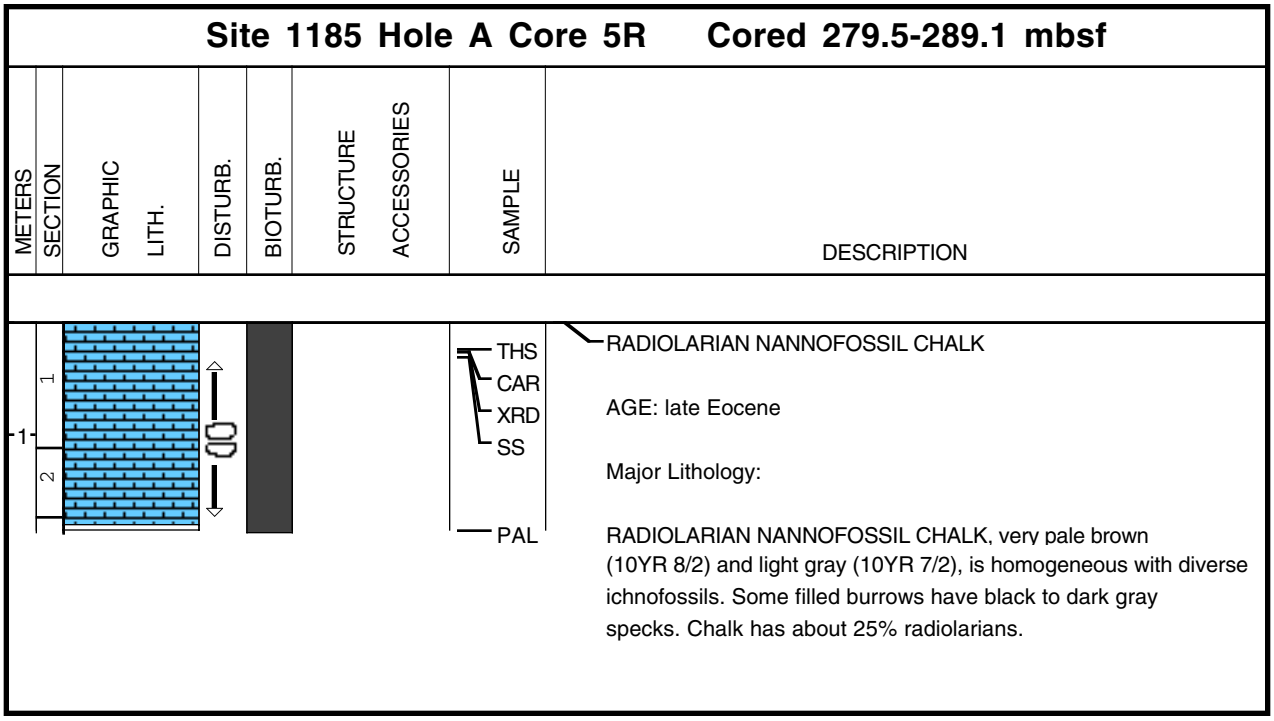
Core Photo


Site 1185 Hole A Core 3R Cored 260.2-269.8 mbsf
METERS
SECTION
GRAPHIC LITH.
DISTURB.
BIOTURB.
STRUCTURE
ACCESSORIES
SAMPLE
DESCRIPTION
1
2
1
2
XRD
CAR
SS
PAL
NANNOFOSSIL CHALK WITH RADIOLARIANS
AGE: late Eocene
Major Lithology:
NANNOFOSSIL CHALK WITH RADIOLARIANS, very pale brown (10YR 8/2 to 10YR 9/1), is homogenous with only a few distinct burrows. Core is heavily disturbed by drilling. Chalk has about 10-15% radiolarians.

Core Photo

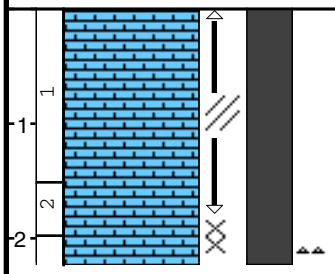

Site 1185 Hole A Core 4R Cored 269.8-279.5 mbsf
METERS
SECTION
GRAPHIC LITH.
DISTURB.
BIOTURB.
STRUCTURE
ACCESSORIES
SAMPLE
DESCRIPTION
1
1
2
THS
XRD
CAR
SS
NANNOFOSSIL CHALK WITH RADIOLARIANS
AGE: late Eocene
Major Lithology:
NANNOFOSSIL CHALK WITH RADIOLARIANS, very pale brown (10YR 8/2) with rare black specks, is homogeneous with only a few distinct burrows. Burrows include Planolites and vertical types, and have rare fillings of darker colored radiolarian nannofossil chalk (30% radiolarians) with opaques. Chalk has about 15% radiolarians.

Core Photo


Site 1185 Hole A Core 5R Cored 279.5-289.1 mbsf
METERS
SECTION
GRAPHIC LITH.
DISTURB.
BIOTURB.
STRUCTURE
ACCESSORIES
SAMPLE
DESCRIPTION
1
1
2
THS
CAR
XRD
SS
PAL
RADIOLARIAN NANNOFOSSIL CHALK
AGE: late Eocene
Major Lithology:
RADIOLARIAN NANNOFOSSIL CHALK, very pale brown (10YR 8/2) and light gray (10YR 7/2), is homogeneous with diverse ichnofossils. Some filled burrows have black to dark gray specks. Chalk has about 25% radiolarians.

Core Photo

Site 1185 Hole A Core 6R Cored 289.1-298.8 mbsf



RADIOLARIAN NANNOFOSSIL CHALK

AGE: middle to late Eocene

Major Lithology:

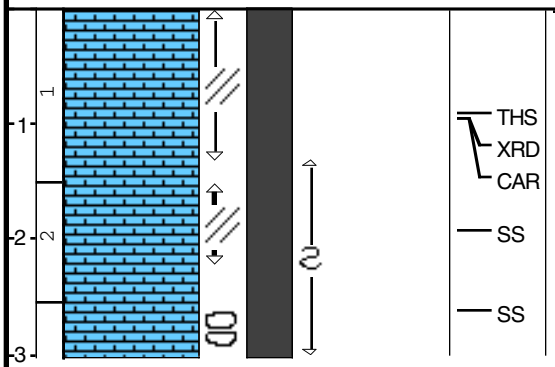
RADIOLARIAN NANNOFOSSIL CHALK, light gray (10YR 7/2), is homogeneous and bioturbated with diverse ichnofossils, especially Planolites. Some oval burrows have light pale brown (10YR 8/2) haloes and darker fillings. Chalk has about 25% radiolarians. A piece of very pale brown (10YR 8/2) chalk in Section 2, 36-39 cm, has Planolites burrows surrounded by clusters of fine dark specks, that may be pyrite.

Minor Lithology:

Several fragments of CHERT, light yellowish brown (10YR 6/4) to yellowish brown, are in Section CC. Some pieces have a partial rind of bioturbated chalk.

Core Photo

Site 1185 Hole A Core 7R Cored 298.8-308.4 mbsf



DESCRIPTION

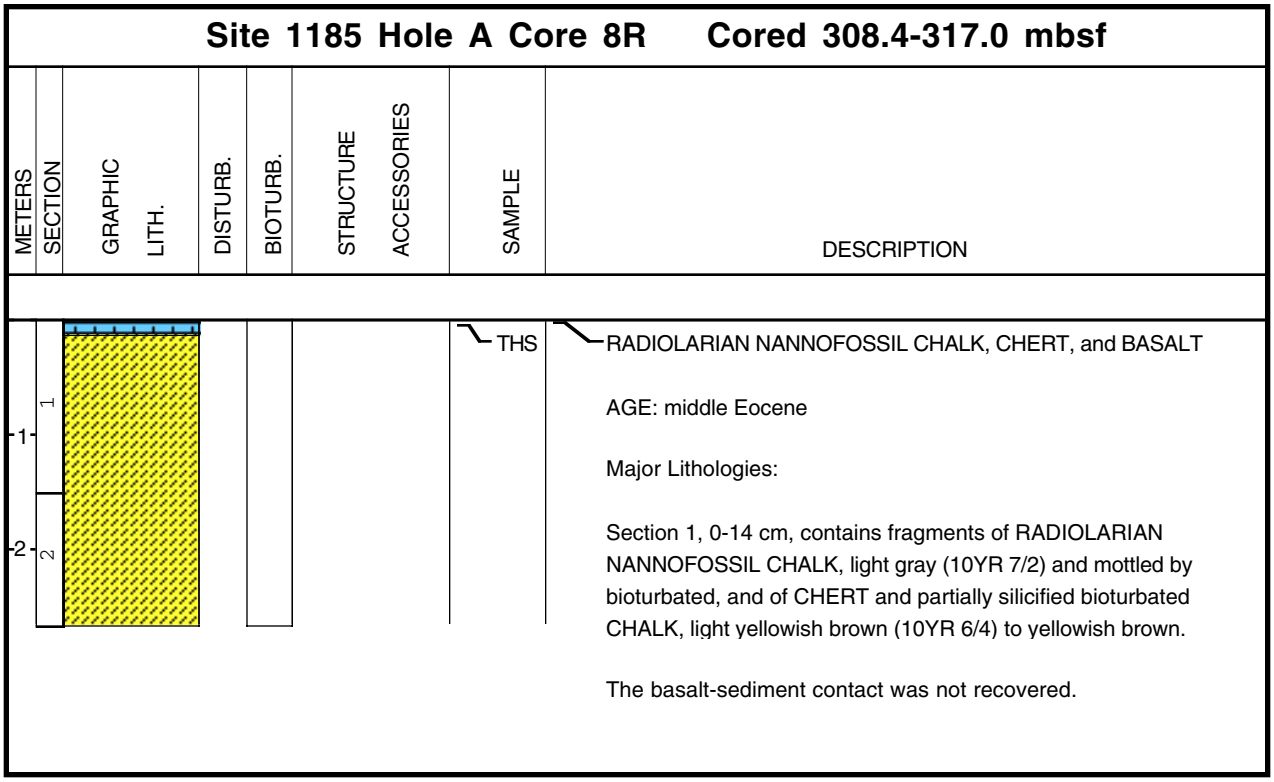
RADIOLARIAN NANNOFOSSIL CHALK

AGE: middle Eocene

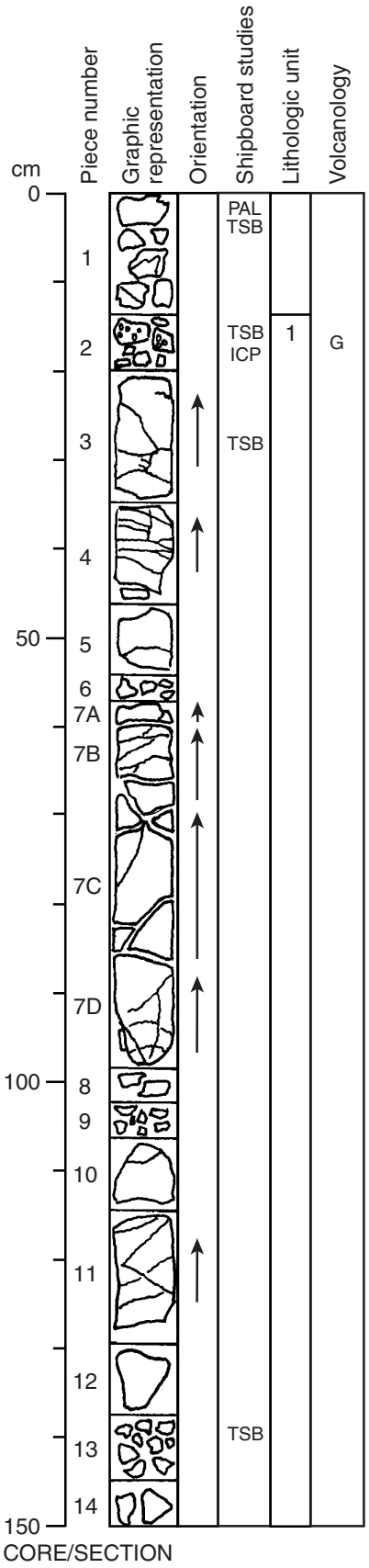
Major Lithology:

RADIOLARIAN NANNOFOSSIL CHALK, light gray (10YR 7/2), is mottled by bioturbation, commonly with Planolites and vertical burrows. Chalk has about 25% radiolarians. From Section 1, 139 cm through Section CC is a slump structure in which soft-sediment deformation has highly stretched, distorted, and partially overturned the bioturbation. Planolites burrows penetrate downward through the uppermost 15 cm (Section 1, 129-144 cm) of slump, indicating that the slump is synsedimentary. A yellowish green, 2-mm, triangular clast at Section CC, 7 cm, is surrounded by a light pale brown (10YR 8/2) halo, and is composed of transparent isotropic glass shards and rounded semi-opaque grains.

Core Photo


Site 1185 Hole A Core 8R Cored 308.4-317.0 mbsf
METERS
SECTION
GRAPHIC LITH.
DISTURB.
BIOTURB.
STRUCTURE
ACCESSORIES
SAMPLE
DESCRIPTION
1
2
THS
RADIOLARIAN NANNOFOSSIL CHALK, CHERT, and BASALT
AGE: middle Eocene
Major Lithologies:
Section 1, 0-14 cm, contains fragments of RADIOLARIAN NANNOFOSSIL CHALK, light gray (10YR 7/2) and mottled by bioturbated, and of CHERT and partially silicified bioturbated CHALK, light yellowish brown (10YR 6/4) to yellowish brown.
The basalt-sediment contact was not recovered.

Core Photo



192-1185A-8R-1 **Section Top: 308.40 mbsf**

UNIT 1: APHYRIC BASALT

Pieces: 2–14

CONTACTS: Not recovered. The contact between Unit 1 and the overlying limestone is inferred to be between Pieces 1 and 2.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Plagioclase:	<<1	~1	~0.1	~0.5	Subhedral stubby to elongate laths
Olivine:	<1	~1	~0.1	~0.5	Subhedral to euhedral

Small plagioclase phenocrysts are present only in the aphanitic region at the top of the unit (Piece 2).

GROUNDMASS: Aphanitic to fine grained; fine-grained regions have variolitic texture. Piece 3 varies from aphanitic, with spherulitic texture, to fine grained, with variolitic texture. Very small (<0.1 mm), altered, elongate olivine crystals are present in the groundmass.

VESICLES: Generally nonvesicular. Rare round vesicles are ~0.1 to 0.8 mm.

COLOR: Pinkish gray (5YR 7/2) near the top grading to light gray (N7) downsection.

STRUCTURE: Massive. Pieces 3 to 12 probably represent a single cooling unit.

ALTERATION: Slight to high. Most of the olivine phenocrysts are altered; some are unaltered. Alteration is more intense at the top of the section than at the bottom. It is also intense near the veins and accentuates the visibility of the olivine phenocrysts.

VEINS/FRACTURES: Highly veined, particularly in Pieces 4–7D. Veins are <1-2.5 mm wide and are filled with green clay, Fe oxyhydroxide, and carbonate.

COMMENTS: Piece 2 comprises individual fragments, some of which contain isolated or coalesced spherulites; one fragment has attached glass; other fragments of Piece 2 are altered glass with attached limestone fragments.

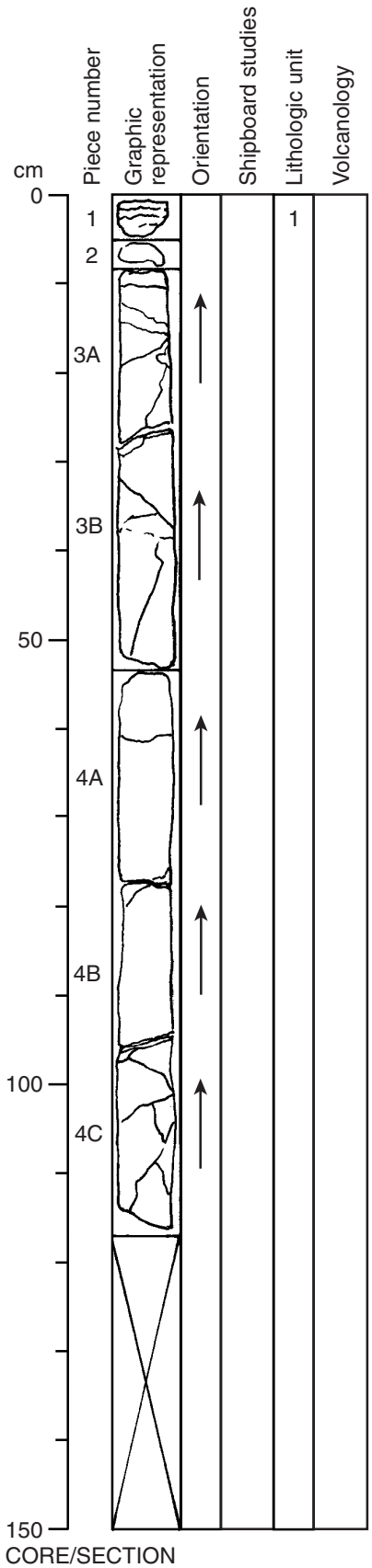
Description of thin section at 15-18 cm

Description of thin section at 25-29 cm

Description of thin section at 140-141cm

Whole-rock ICP-AES data

Core Photo



192-1185A-8R-2 **Section Top: 309.90 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–4C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	4–10			<1	Subhedral to euhedral

GROUNDMASS: Aphanitic, with spherulitic texture visible in regions that are stained by alteration.

VESICLES: Nonvesicular.

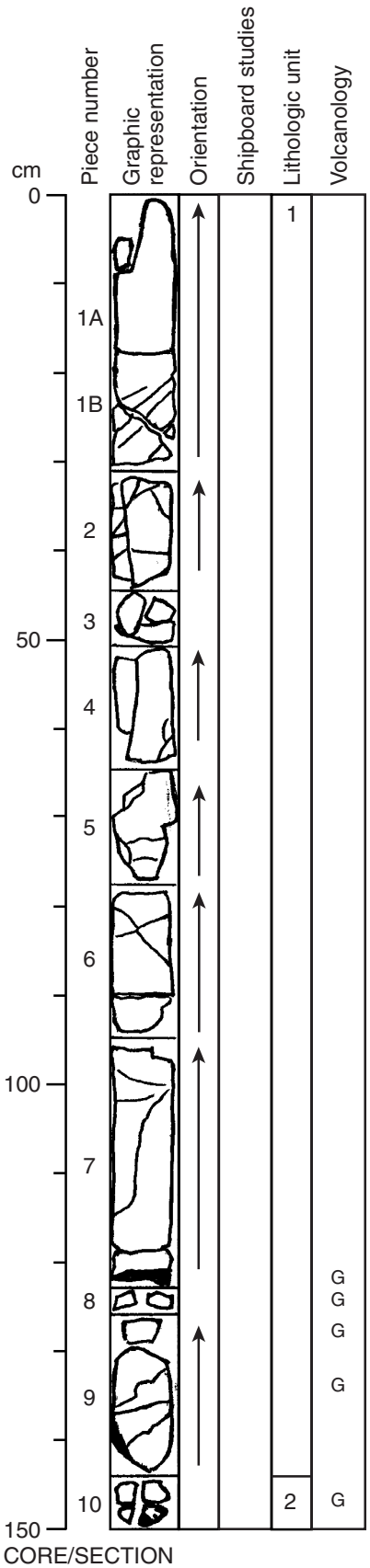
COLOR: Very light gray (N8) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight; high near veins.

VEINS/FRACTURES: Moderately veined. Veins are <1-5 mm wide and are filled with calcite, Fe oxyhydroxide and greenish clay.

Core Photo



192-1185A-9R-1 **Section Top: 317.00 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–9

CONTACTS: Not recovered. The contact between Units 1 and 2 is inferred to be between Pieces 9 and 10.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1.5	0.2	0.5	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers (e.g., Piece 9).

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to pinkish gray (5YR 7/2).

STRUCTURE: Pillowed. Glassy margins are present on Pieces 7–9. A curved pillow margin is present on Piece 9.

ALTERATION: Moderate. Olivine phenocrysts are replaced by carbonate and green clay.

VEINS/FRACTURES: Moderately veined and fractured. Veins are <1-3 mm wide and are filled with carbonate and green clay.

COMMENTS: Some aphanitic regions close to pillow margins have more abundant olivine phenocrysts.

UNIT 2: SPARSELY OLIVINE-PHYRIC BASALTIC BRECCIA

Piece: 10

CONTACTS: Not recovered. The contact between Units 1 and 2 is inferred to be between Pieces 9 and 10.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1	1.0	0.5	0.8	Euhedral to subhedral

GROUNDMASS: Basaltic clasts are glassy to aphanitic.

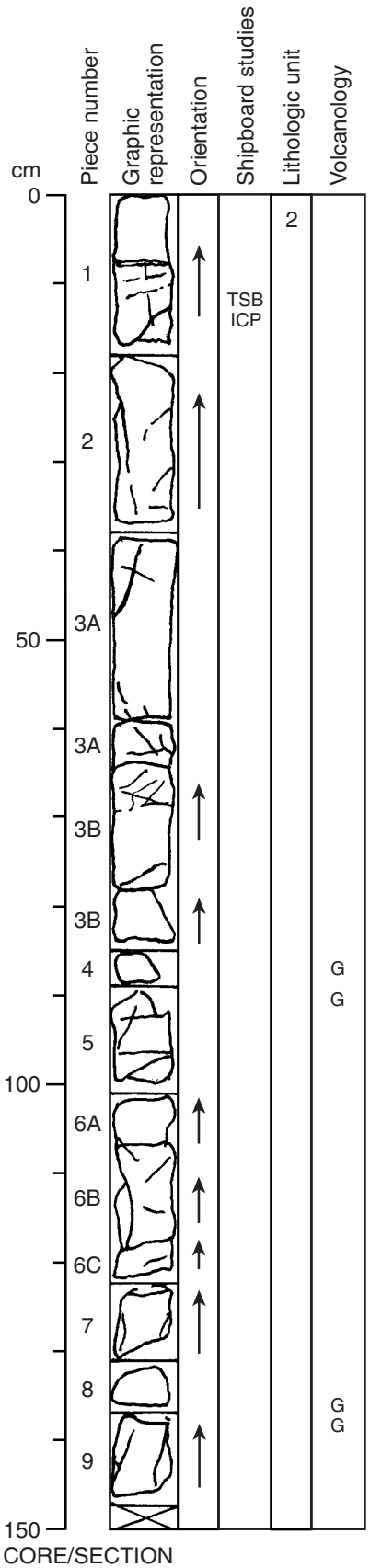
VESICLES: Nonvesicular.

COLOR: Basaltic glass is light gray (N7); basalt is dark greenish gray (5GY 4/1); limestone is grayish pink (5R 8/2).

STRUCTURE: Clasts of basalt and limestone in a crystalline carbonate matrix; probably brecciated top of flow unit. There are approximately equal proportions of basalt and limestone.

ALTERATION: Slight to high. Basaltic clasts are altered to green clay.

Core Photo



192-1185A-9R-2 **Section Top: 318.50 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–9

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	4–10	1	0.3	0.8	Euhedral

GROUNDMASS: Aphanitic to fine grained. Plagioclase spherulites in aphanitic regions have olivine phenocrysts at their centers. Aphanitic patches are in Pieces 1, 4, 5, 6A and 9; other pieces are fine grained.

VESICLES: Nonvesicular.

COLOR: Medium dark gray (N4) to medium light gray (N6).

STRUCTURE: Pillowed. Pillows are inferred from the presence of curved glassy margins.

ALTERATION: Moderate. Alteration halos are present around the olivine phenocrysts. Olivine is replaced by orange-brown clay and dark green clay.

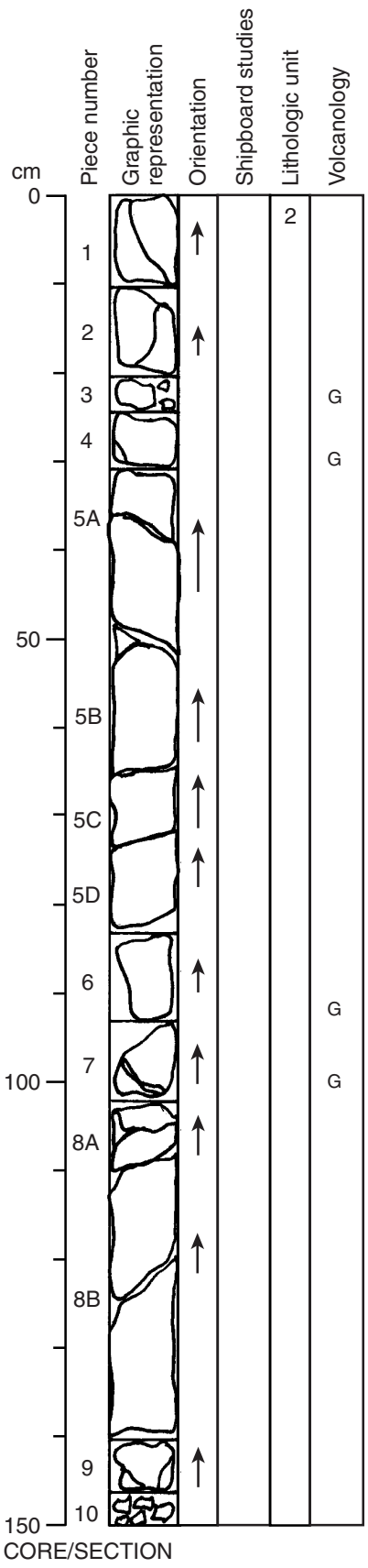
VEINS/FRACTURES: Moderately veined. Veins are 1-4 mm wide and are filled with white carbonate and brown and green clay.

COMMENTS: Pillow margin in Piece 8 contains alternating layers with abundant olivine phenocrysts and spherulites.

Description of thin section at 10-13 cm

Whole-rock ICP-AES data

Core Photo



192-1185A-9R-3 **Section Top: 319.98 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–10

CONTACTS: None.

PHENOCRYSTS:

	% Grain Size (mm): Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1	0.6	0.8	Euhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites are present in aphanitic regions.

VESICLES: Nonvesicular.

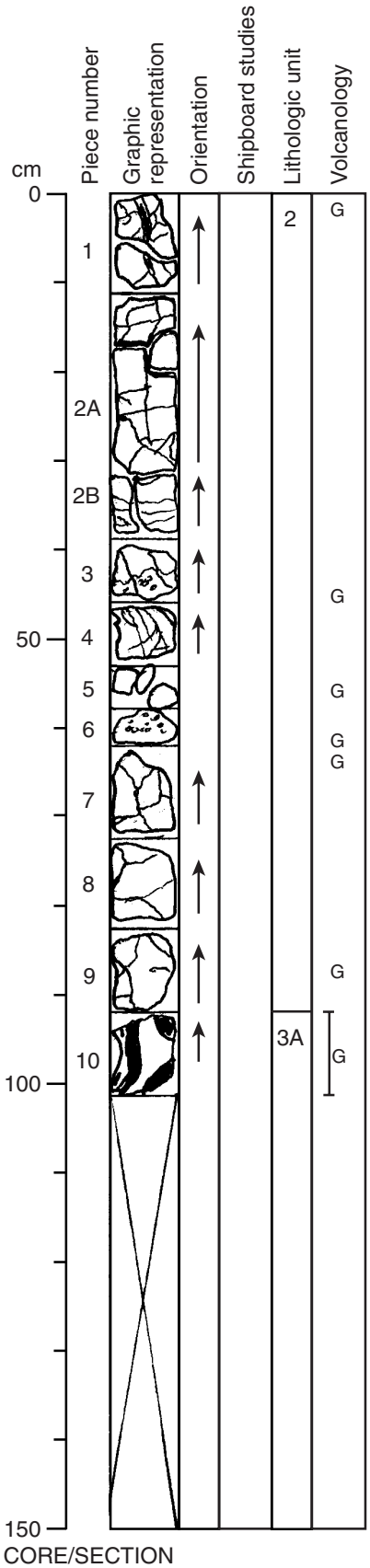
COLOR: Medium light gray (N6) to grayish brown (10YR 5/2).

STRUCTURE: Pillowed. Glassy margins are present in Pieces 3, 4, 6, and 7.

ALTERATION: Slight to moderate. Olivine phenocrysts and spherulites are replaced by brown clay.

VEINS/FRACTURES: Moderately veined. Pervasive calcite veins are present along pillow margins. Veins range in width from <1-4 mm.

Core Photo



192-1185A-9R-4 **Section Top: 321.48 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–9

CONTACTS: The contact between Units 2 and 3A is inferred to be between Pieces 9 and 10.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–8			<1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers.

VESICLES: Nonvesicular.

COLOR: Medium dark gray (N4) to medium gray (N5).

STRUCTURE: Pillowed. Many pieces have glassy margins.

ALTERATION: Moderate. Olivine phenocrysts are mostly replaced by brown clay, although some unaltered olivine is present in the groundmass and glass.

VEINS/FRACTURES: Moderately veined. Veins are <1-3 mm wide and are filled with carbonate and brown clay.

UNIT 3A: LIMESTONE AND GLASS

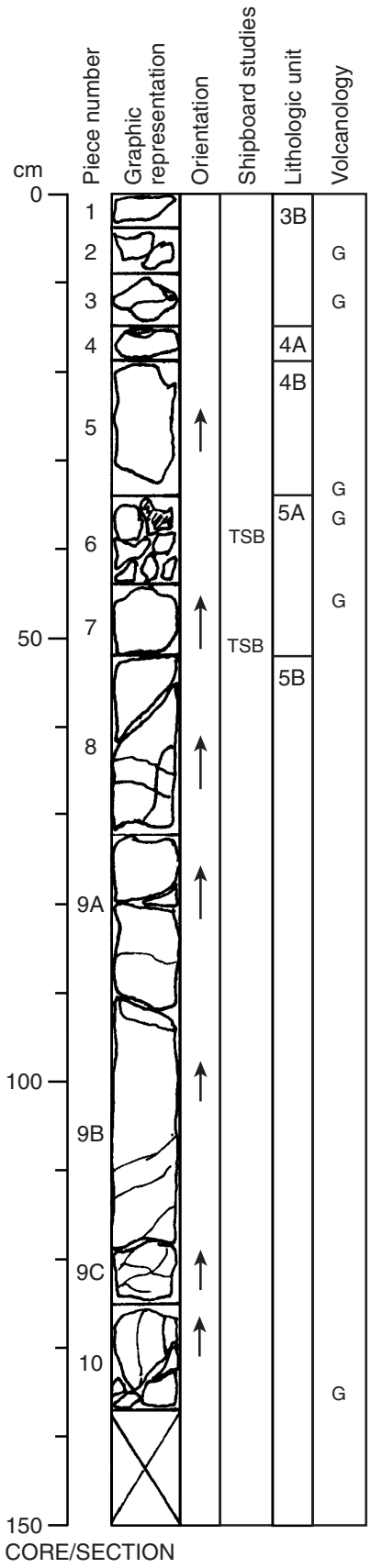
Piece: 10

CONTACTS: Not recovered. The contact between Units 2 and 3A is inferred to be between Pieces 9 and 10.

COLOR: Pale brown (7YR 6/2).

COMMENTS: Limestone between glassy pillow margins.

Core Photo



192-1185A-10R-1 **Section Top: 322.6 mbsf**

UNIT 3B: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–3

CONTACTS: Not recovered. The contact between Units 3A and 3B is inferred to be at the top of this section. The contact between Units 3B and 4A is inferred to be between Pieces 3 and 4.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	4–10	1.3	0.3	0.7	Subhedral to euhedral

GROUNDMASS: Aphanitic. Spherulites have olivine phenocrysts at their centers.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight to moderate. Olivine is replaced by golden-brown and green-black clay.

VEINS/FRACTURES: None.

COMMENTS: Unaltered olivine phenocrysts are present in the glass in Piece 3.

UNIT 4A: LIMESTONE

Piece: 4

CONTACTS: The contact between Units 3B and 4A is inferred to be between Pieces 3 and 4 and the contact between Units 4A and 4B is inferred to be between Pieces 4 and 5.

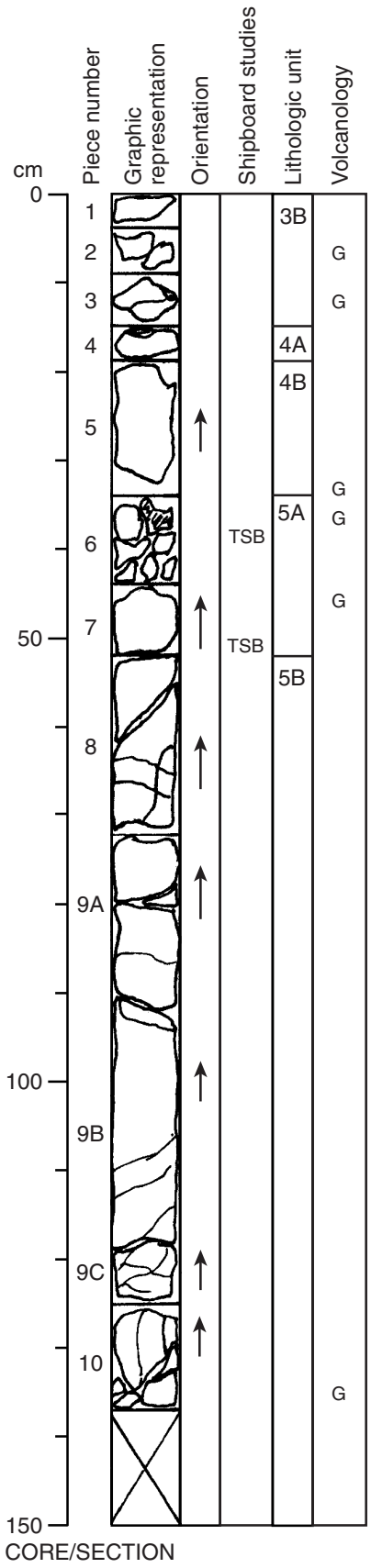
COLOR: Pale brown (10YR 6/3).

COMMENTS: Recrystallized limestone interbed. Piece 4 also has glass at the base.

Description of thin section at 38-40 cm

Description of thin section at 48-51 cm

Core Photo



192-1185A-10R-1 **Section Top: 322.60 mbsf**

UNIT 4B: MODERATELY OLIVINE-PHYRIC BASALT

Piece: 5

CONTACTS: Not recovered. The contact between Units 4A and 4B is inferred to be between Pieces 4 and 5 and the contact between Units 4B and 5A is inferred to be between Pieces 5 and 6.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	3	1	0.4	0.5	Euhedral

GROUNDMASS: Aphanitic; spherulitic.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

STRUCTURE: Pillowed. Piece 5 has a glassy margin.

ALTERATION: Moderate. Vein margins and spherulites are altered to brown clay.

VEINS/FRACTURES: Sparsely to moderately veined. The veins are <1-2 mm wide and are filled with carbonate.

UNIT 5A: LIMESTONE

Pieces: 6–7

CONTACTS: Not recovered. The contact between Units 4B and 5A is inferred to be between Pieces 5 and 6 and the contact between Units 5A and 5B is inferred to be between Pieces 7 and 8.

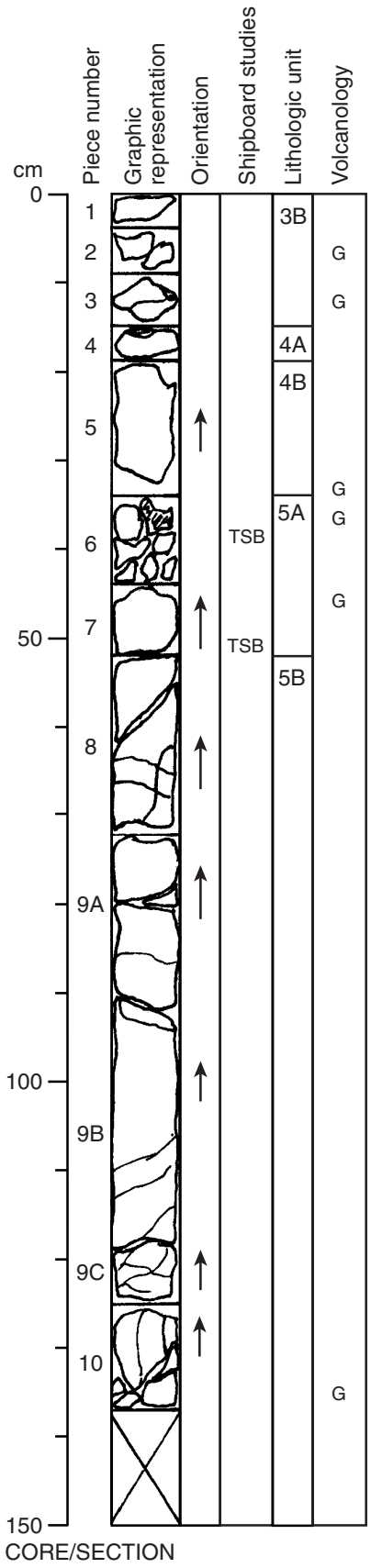
COLOR: Pale brown (10YR 6/3).

COMMENTS: Piece 6 consists of many individual fragments, some with fresh glass attached.

Description of thin section at 38-40 cm

Description of thin section at 48-51 cm

Core Photo



192-1185A-10R-1 **Section Top: 322.60 mbsf**

UNIT 5B: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 8–10

CONTACTS: Not recovered. The contact between Units 5A and 5B is inferred to be between Pieces 7 and 8.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–5	3	0.5	1	Euhedral

GROUNDMASS: Aphanitic to fine grained. Skeletal plagioclase and olivine crystals are present. Fine-grained regions have variolitic texture. Spherulites are present ~1–2 cm from pillow margins and increase in abundance towards pillow interiors.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Pillowed.

ALTERATION: Moderate. Alteration halos are present near veins and around spherulites. Olivine is replaced by orange-brown clay.

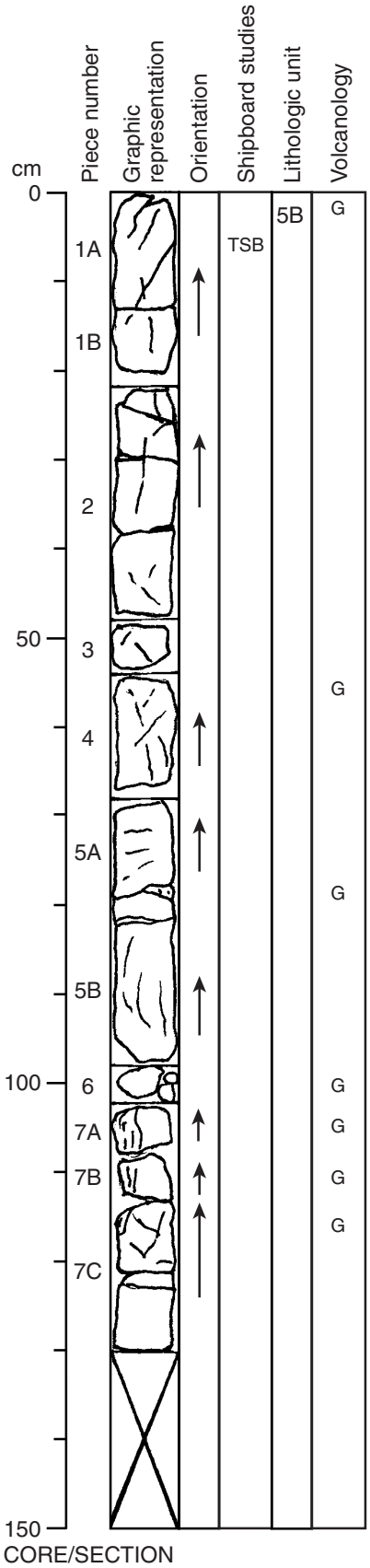
VEINS/FRACTURES: Sparsely to moderately veined. Veins and fractures are <1-4 mm wide and are filled with carbonate.

COMMENTS: Pieces 8–10 may represent one pillow. The top of Piece 8 and the base of Piece 10 are aphanitic with a spherulitic texture.

Description of thin section at 38-40 cm

Description of thin section at 48-51 cm

Core Photo



192-1185A-10R-2 **Section Top: 323.98 mbsf**

UNIT 5B: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–7C

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5	1	0.4	0.8	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained. Aphanitic regions have spherulitic texture.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

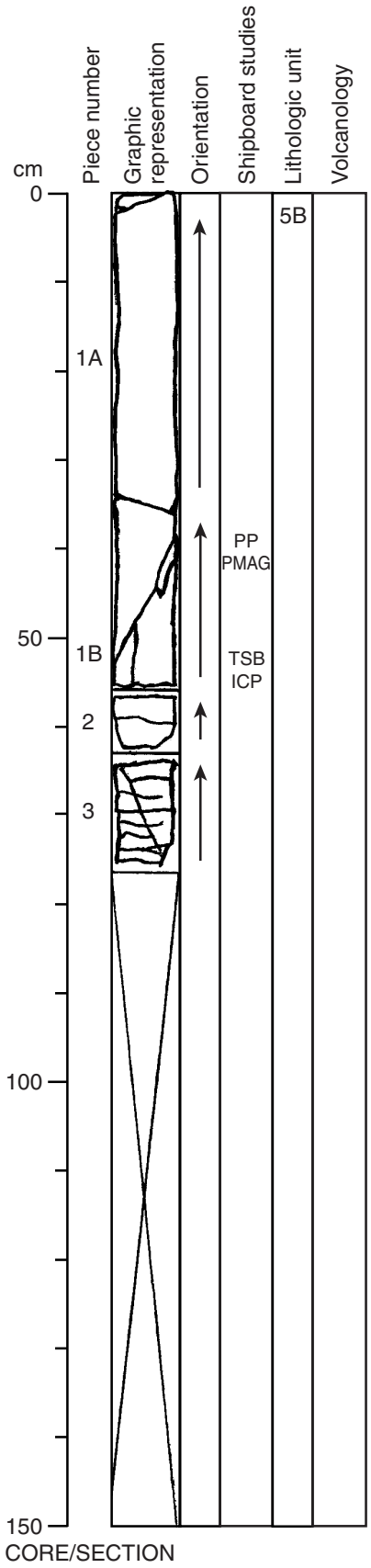
STRUCTURE: Pillowed. Glassy margins are present in many pieces.

ALTERATION: Moderate. Brown halos are present around spherulites. Olivine phenocrysts are replaced by brown clay.

VEINS/FRACTURES: Moderately veined. Pervasive veins are <1-5 mm wide and are filled with carbonate and green clay.

Description of thin section at 3-6 cm

Core Photo



192-1185A-10R-3 **Section Top: 325.27 mbsf**

UNIT 5B: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–3

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–3	1	0.5	0.7	Subhedral

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Massive.

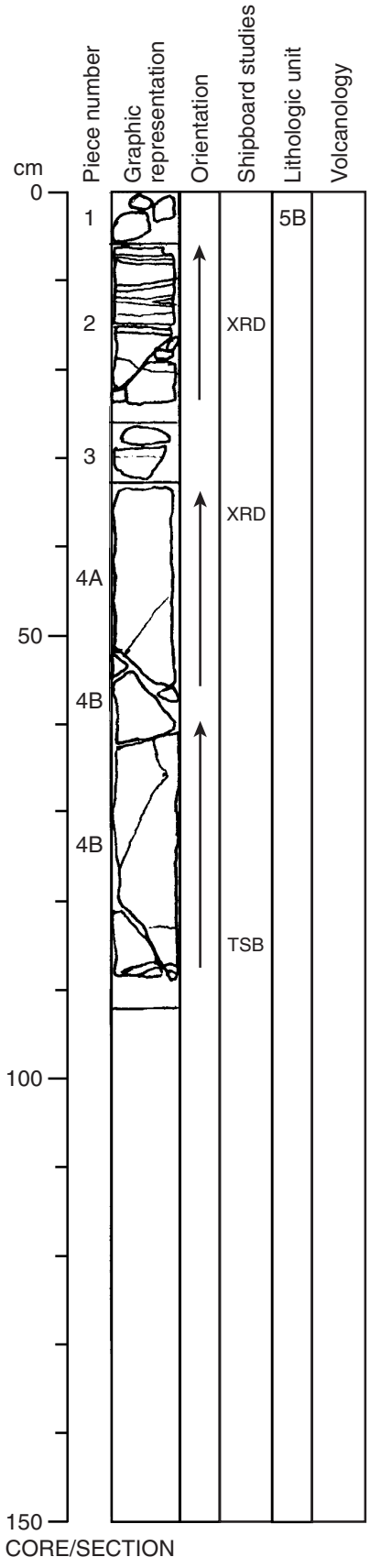
ALTERATION: Moderate to high. Oxidation halos are present near veins in Piece 3.

VEINS/FRACTURES: Sparsely veined. Veins are <1-2 mm wide and are filled with carbonate and green and brown clay.

Description of thin section at 51-54 cm

Whole-rock ICP-AES data

Core Photo



192-1185A-11R-1 **Section Top: 327.70 mbsf**

UNIT 5B: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–4B

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5	1	0.2	0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight (Pieces 4A–4B), moderate (Piece 2) to high (Piece 1). Alteration is associated with veins.

VEINS/FRACTURES: Sparsely veined except for Piece 2, which is moderately veined. Veins are <1-5 mm wide and are filled with white carbonate.

Description of thin section at 83-86 cm

Core Photo

Site 1185 Hole B Core 2R Cored 308.0-315.7 mbsf

METERS	SECTION	GRAPHIC LITH.	DISTURB.	BIOTURB.	STRUCTURE	ACCESSORIES	SAMPLE	DESCRIPTION
1	1						SS	RADIOLARIAN NANNOFOSSIL CHALK

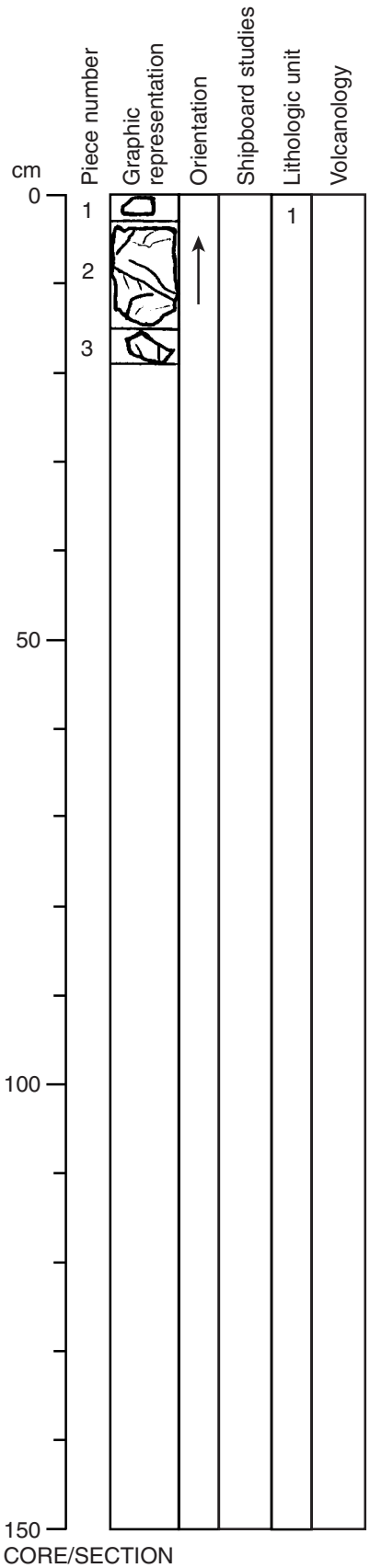
AGE: middle Eocene

Major Lithology:

RADIOLARIAN NANNOFOSSIL CHALK, very pale brown (10YR 8/2 - 10YR 7/3), is mottled throughout. Burrows include Planolites and Chondrites. Some oval burrows have very pale brown (10YR 8/2) rims and are filled with darker CHALK. Pale brown (10YR 6/3) intervals at Section 1, 0-5 cm and 137-150 cm, contain many thin, anastomosing clay seams and are partially silicified. A 5-cm-diameter, white (N9) silicified patch with a light gray (N6) halo spans Section 1 at 12-17 cm.

The basalt-sediment contact was not recovered.

Core Photo



192-1185B-2R-2 **Section Top: 309.51 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–3

CONTACTS: Not recovered. The contact between Unit 1 and the overlying limestone is inferred to be at the top of this section.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5	0.8	0.2	0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers.

VESICLES: Nonvesicular.

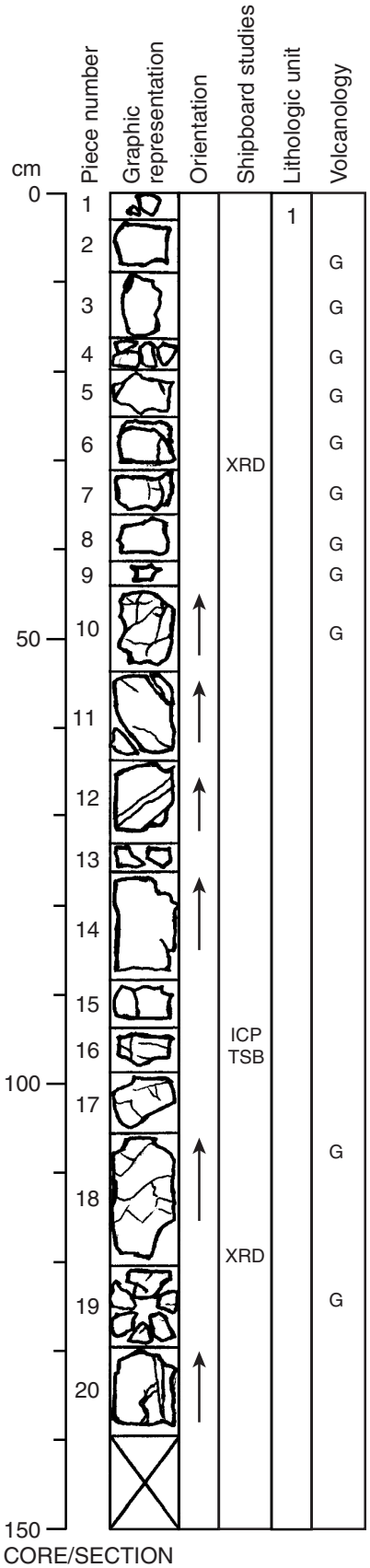
COLOR: Medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: High. Alteration is more intense in Pieces 1 and 2 than in Piece 3.

VEINS/FRACTURES: Moderately veined. The veins are <1-4 mm wide and are filled with carbonate and green clay.

Core Photo



192-1185B-3R-1 **Section Top: 315.70 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–20

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–10	1.5	0.5	0.8	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers. The aphanitic regions grade into fine-grained pillow interiors, which exhibit variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5).

STRUCTURE: Pillowed. Glassy margins are present on many pieces.

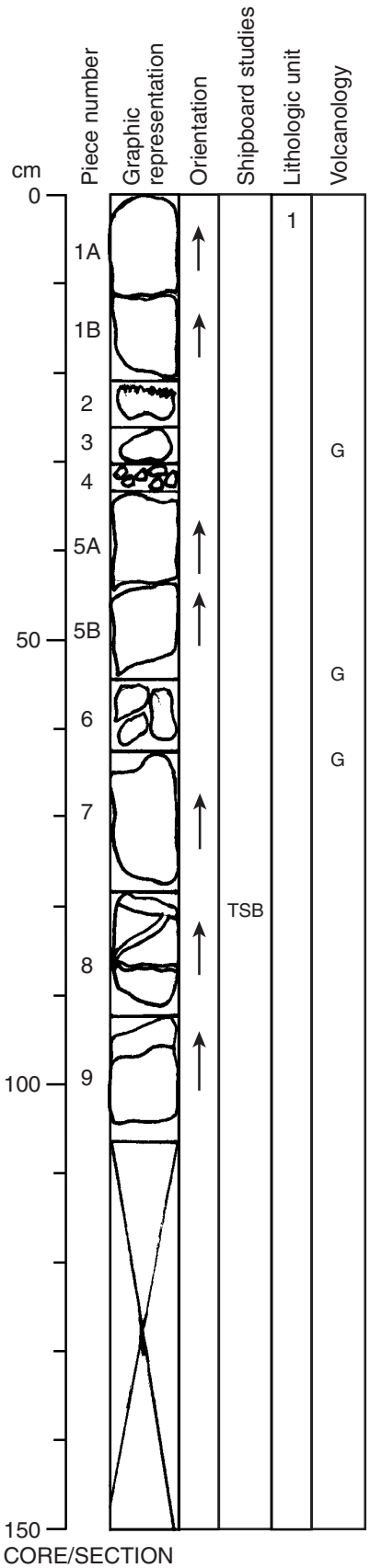
ALTERATION: Slight to high. Brownish yellow (10YR 6/6) oxidation halos are associated with veins and fractures. Variolitic texture in the fine-grained areas is highlighted by the alteration. Most olivine is replaced by white and pink carbonates, but unaltered olivine is present in areas where alteration is slight.

VEINS/FRACTURES: Moderately veined. The veins are <1-6 mm wide and are filled with white and pink carbonates and green clay. Black oxides(?) are concentrated adjacent to <1-mm fractures.

Description of thin section at 94-97 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-3R-2 **Section Top: 317.10 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–9

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–10	1.2	0.3	0.8	Subhedral

GROUNDMASS: Generally aphanitic. Spherulites in aphanitic regions have olivine phenocrysts at their centers.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5) in unaltered regions.

STRUCTURE: Pillowed. Glassy margins are present on Pieces 3, 5B, and 7.

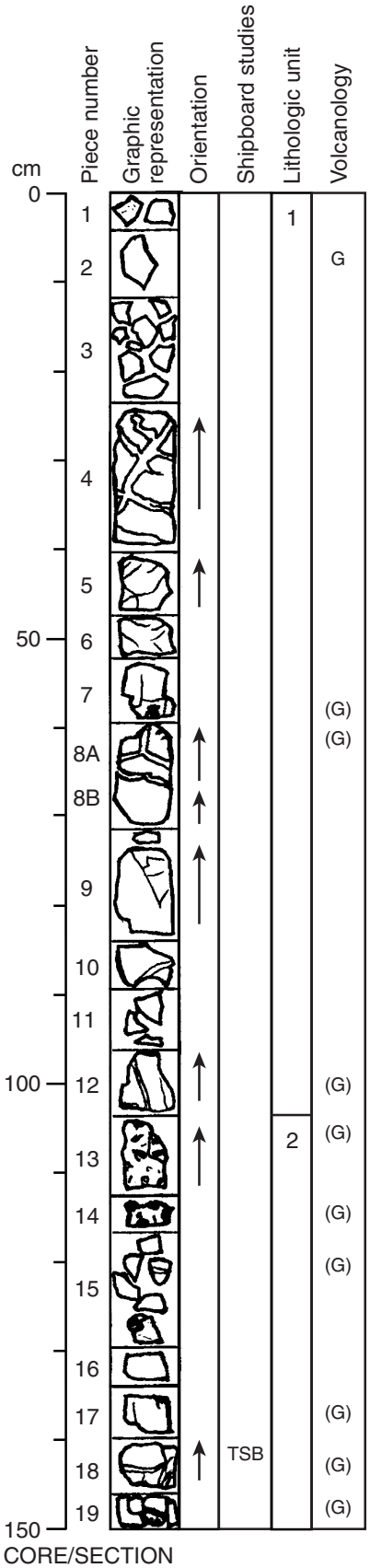
ALTERATION: Slight to high. Patchy alteration highlights spherulites in Pieces 5–7. Alteration of coalesced spherulites in other pieces gives the basalt a brownish yellow (10YR 6/6) color. Most olivine is replaced by Fe oxyhydroxide and white carbonate, but unaltered olivine is present in areas where alteration is slight.

VEINS/FRACTURES: Moderately veined. Veins are <1-20 mm wide.

COMMENTS: Piece 1 contains a thick vein filled with fine-grained limestone and coarsely-crystalline calcite. Similar material is present along the margins of Pieces 2, 8, and 9. The limestone is beige (10R 8/2) to pink (10R 7/4).

Description of thin section at 79-82 cm

Core Photo



192-1185B-4R-1 **Section Top: 319.2 mbsf**

UNIT 1: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–12

CONTACTS: Not recovered. The contact between Units 1 and 2 is inferred to be between Pieces 12 and 13.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–10	1.5	0.3	0.9	Euhedral

GROUNDMASS: Aphanitic. Elongate olivine, highlighted by alteration, is present throughout the section.

VESICLES: Nonvesicular.

COLOR: Medium dark gray (N4).

STRUCTURE: Pillowed. Glassy margins are present on Pieces 2, 7, 8A and 12.

ALTERATION: Slight to high. Altered spherulites are concentrated near pillow margins. Piece 2 has altered spherulites that appear to parallel a pillow margin. Pieces 2, 3, 7 and 12 are the least altered. Olivine is replaced by Fe oxyhydroxide, yellow-green clay, and white carbonate.

VEINS/FRACTURES: Pink and white carbonate-filled veins are present in Pieces 4 and 8. Some veins are filled with white carbonate (stained by alteration). Veins in Piece 8A contain a breccia of altered glass and pink carbonate.

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT AND HYALOCLASTITE

Pieces: 13–19

CONTACTS: Not recovered. The contact between Units 1 and 2 is inferred to be between Pieces 12 and 13.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–6	1.2	0.3	0.6	Euhedral

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Medium dark gray (N4).

STRUCTURE: Pillowed. Glassy margins are present on Pieces 13, 14, 17 and 18.

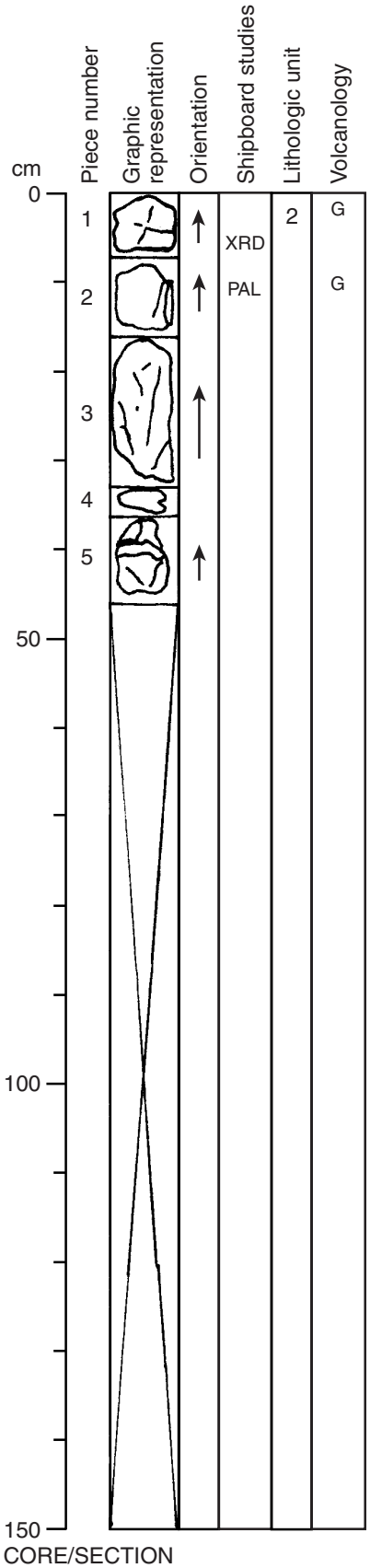
ALTERATION: Slight to moderate. Aphanitic regions contain altered spherulites. The hyaloclastites are highly altered. Elongate olivine is highlighted by alteration. Most olivine is replaced by Fe oxyhydroxide, but unaltered olivine is present in regions where alteration is slight.

VEINS/FRACTURES: Sparsely to highly veined and fractured. The veins are <1-5 mm wide and are filled with calcite.

COMMENTS: Pieces 13-15 and 18-19 are brecciated hyaloclastites containing green altered glass, white and pink carbonate, and brown smectite.

Description of thin section at 142-144 cm

Core Photo



192-1185B-4R-2 **Section Top: 320.70 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1.2	0.5	0.8	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Spherulites in aphanitic regions have olivine phenocrysts at their centers and in places have coalesced.

VESICLES: Nonvesicular.

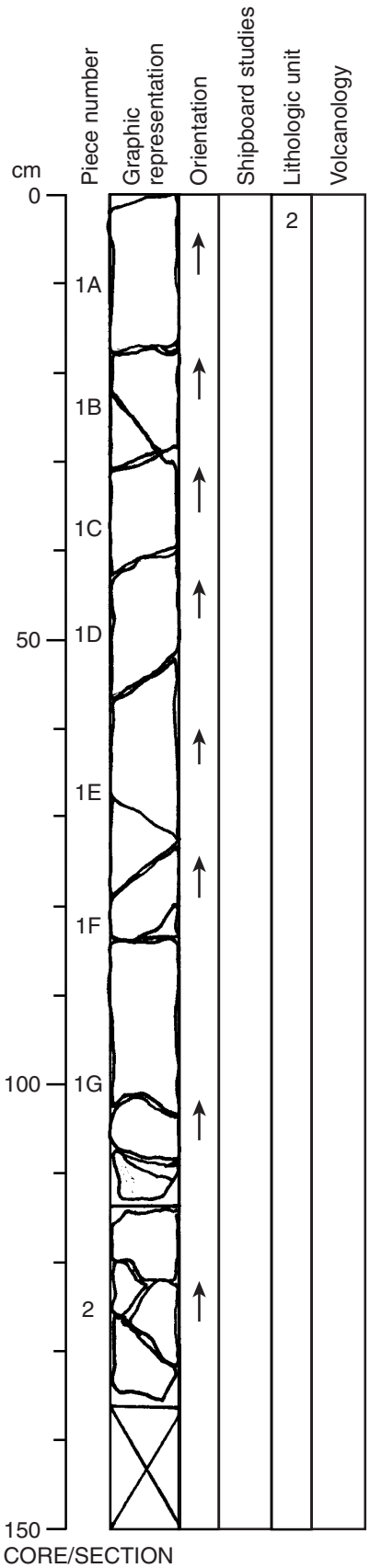
COLOR: Medium light gray (N5).

STRUCTURE: Pillowed. Glassy margins are present on Piece 1 and on Piece 2 below the vein.

ALTERATION: Moderate to high. Spherulites in the fine-grained regions are highlighted by the alteration.

VEINS/FRACTURES: Moderately veined. Veins are <1-18 mm wide and are filled with white crystalline carbonate, a fine-grained pink carbonate, and green clay.

Core Photo



192-1185B-4R-3 **Section Top: 321.17 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–5	0.8	0.2	0.5	Subhedral to euhedral

GROUNDMASS: Fine grained. Plagioclase, olivine and mesostasis show variolitic texture.

VESICLES: Nonvesicular.

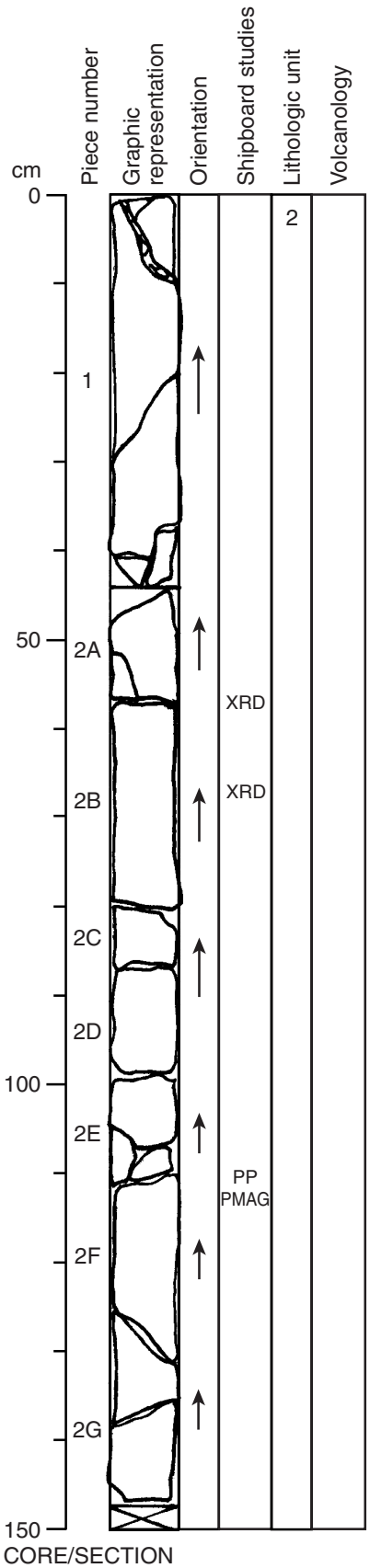
COLOR: Medium light gray (N6).

STRUCTURE: Massive. No glassy margins are present.

ALTERATION: Moderate. Olivine phenocrysts are altered to green and brown clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-8 mm wide and are filled with carbonate. Oxidation fronts are present around the veins.

Core Photo



192-1185B-4R-4 **Section Top: 322.53 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–2G

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	~3	1	0.5	1	Subhedral

GROUNDMASS: Fine grained. Olivine, plagioclase and other microlites show variolitic texture.

VESICLES: Nonvesicular.

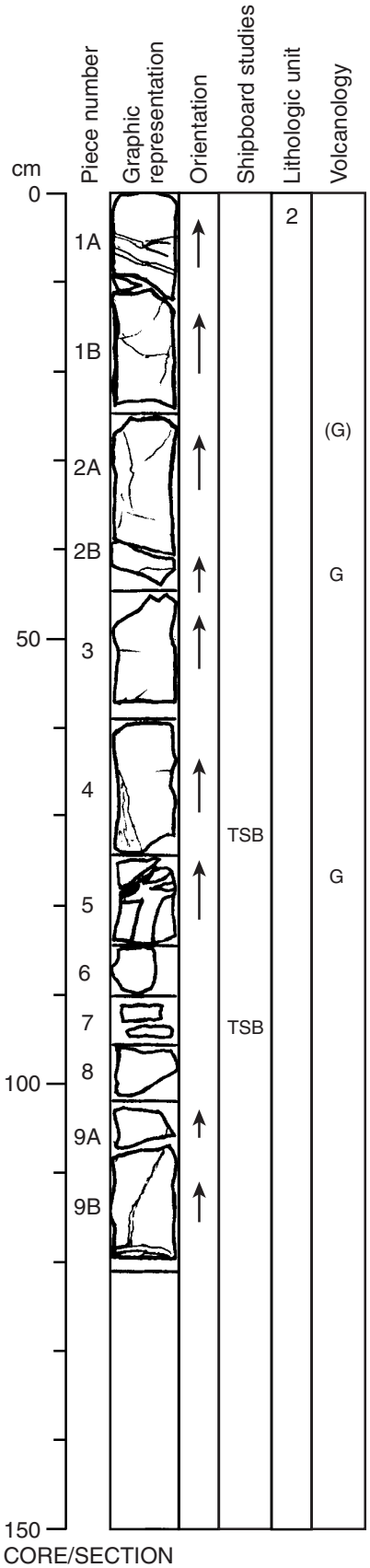
COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive. No glassy margins are present.

ALTERATION: Moderate.

VEINS/FRACTURES: Moderately veined. Veins are <1-5 mm wide and are filled with smectite, calcite, and small fragments of the host basalt.

Core Photo



192-1185B-4R-5 **Section Top: 324.00 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–9B

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–4	1	0.3	0.6	Euhedral

GROUNDMASS: Fine grained except for an aphanitic area adjacent to the glass in Piece 2. Contains plagioclase, olivine and clinopyroxene.

VESICLES: Nonvesicular.

COLOR: Light gray (N7).

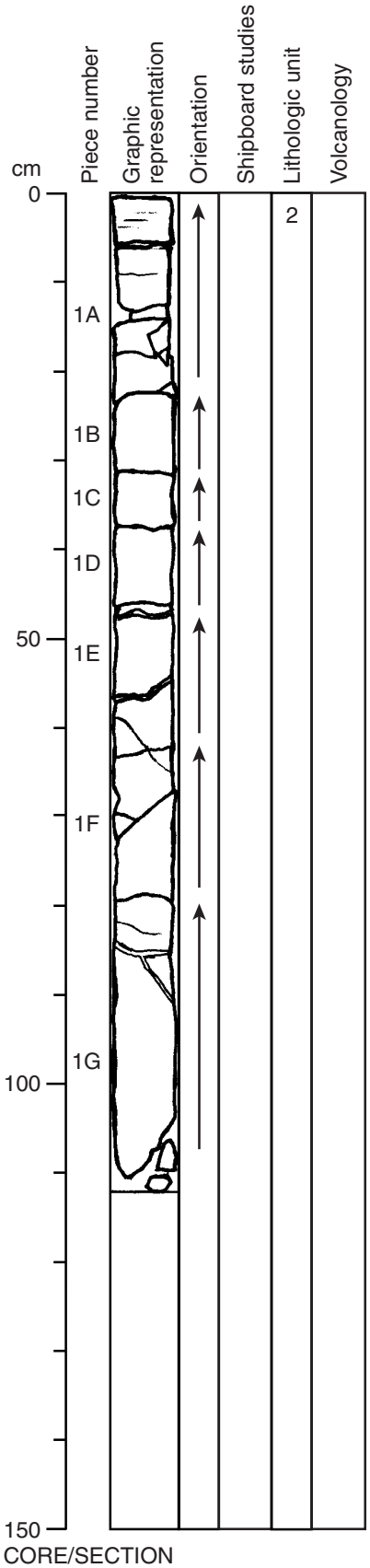
STRUCTURE: Pillowed. Piece 2 appears to be a section through a pillow, with glassy margins at the top and bottom of the piece. Pillow shape is highlighted by altered spherulites.

ALTERATION: Moderate. The olivine phenocrysts are replaced by golden-brown clay.

VEINS/FRACTURES: Moderately veined. Some fractures are filled with limestone containing basalt and glass fragments.

COMMENTS: The apparent decrease in olivine phenocryst concentration is due to the increase in groundmass grain size; the abundance of small euhedral olivine crystals remains approximately constant throughout the section.

Core Photo



192-1185B-4R-6 **Section Top: 325.21 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1G

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2	1	0.3	0.5	Subhedral to euhedral

GROUNDMASS: Fine grained with variolitic texture. Contains olivine, plagioclase and interstitial material.

VESICLES: Nonvesicular.

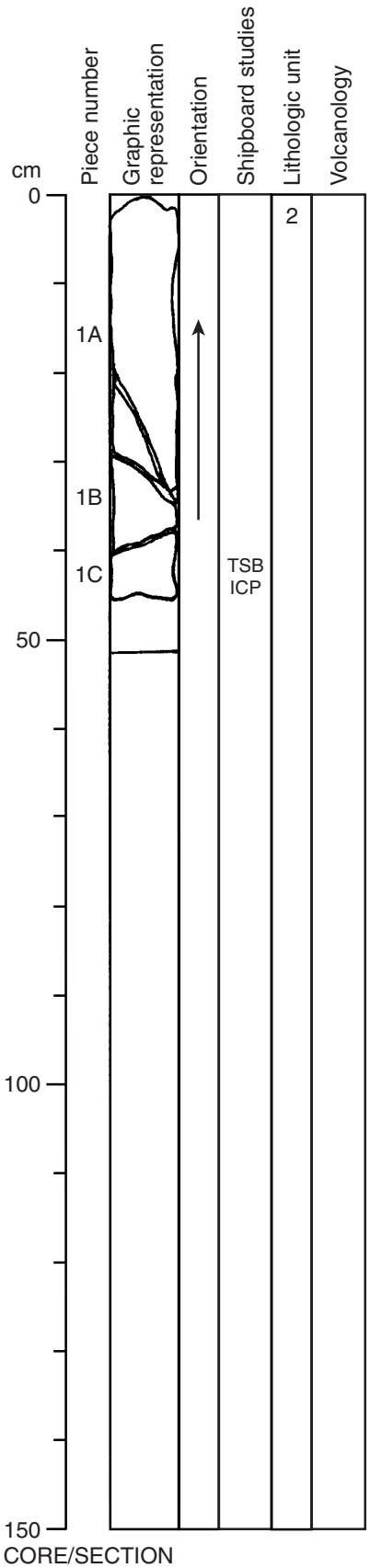
COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Moderate.

VEINS/FRACTURES: Sparsely veined. Veins are <1-6 mm wide and are filled with carbonate and green clay.

Core Photo



192-1185B-4R-7 **Section Top: 326.33 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	~3	2	0.5	1	Subhedral

GROUNDMASS: Fine grained with variolitic texture. Altered elongate olivine and plagioclase crystals are visible.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

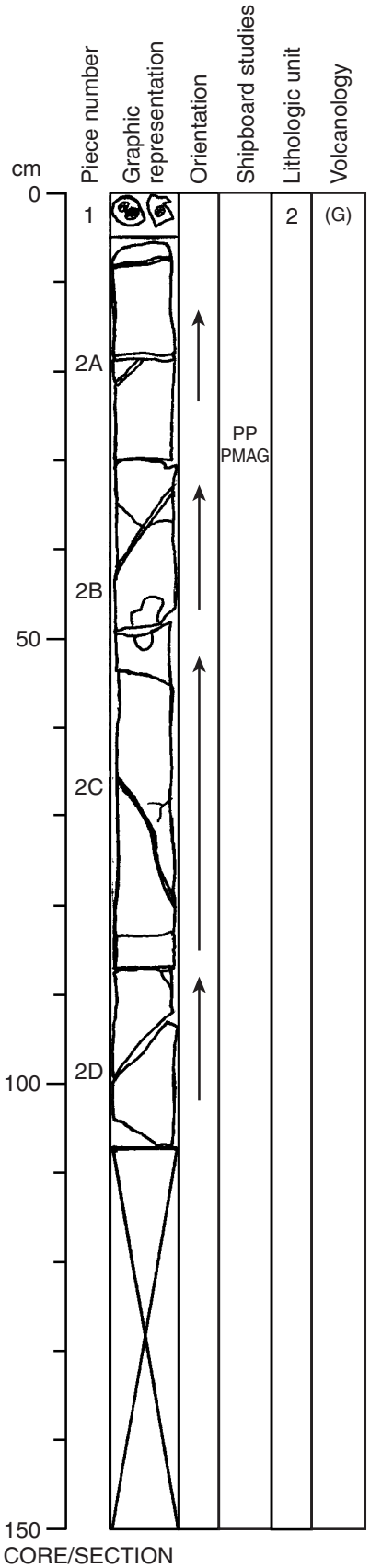
ALTERATION: Moderate.

VEINS/FRACTURES: Moderately veined. Veins are <1-5 mm wide and are filled with white and pink carbonate.

Description of thin section at 44-46 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-5R-1 **Section Top: 328.80 mbsf**

UNIT 2: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–2D

CONTACTS: None.

PHENOCRYSTS:

	% Grain Size (mm): Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1	<0.1	0.1	Euhedral to subhedral

Olivine phenocryst density varies throughout the section, reaching a maximum of 5% locally.

GROUNDMASS: Fine grained with variolitic texture. Contains plagioclase, clinopyroxene, and black oxides. Elongate olivine crystals are present throughout, but are only readily visible where brown alteration has caused the olivine to be highlighted.

VESICLES: Nonvesicular.

COLOR: Mottled. Very light gray (N8) to medium light gray (N6).

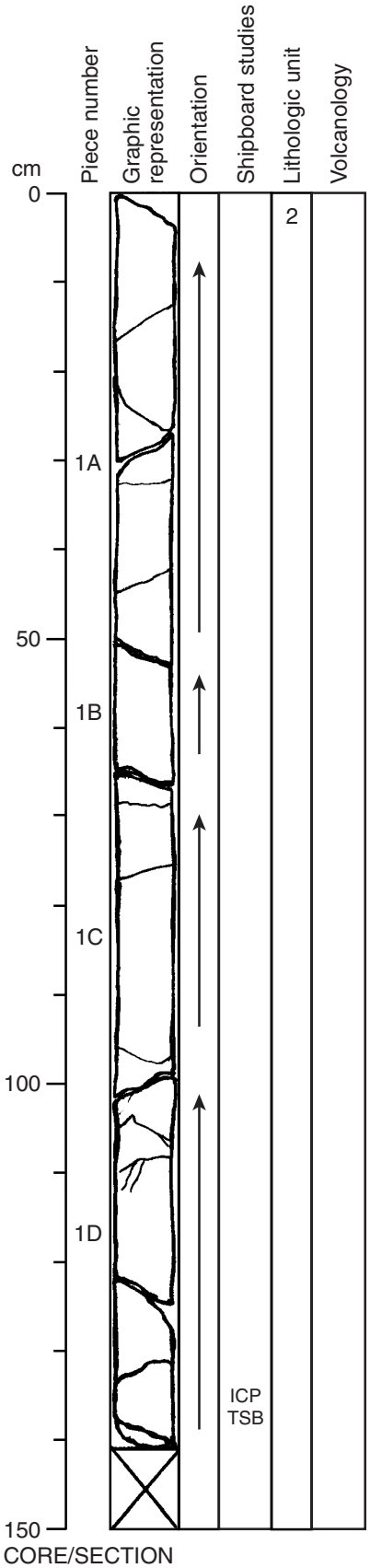
STRUCTURE: Massive.

ALTERATION: Slight to moderate near veins. Olivine phenocrysts are replaced by dark-colored clays.

VEINS/FRACTURES: Moderately veined. Veins are <1-2 mm wide and are filled with white calcite, pink-brown limestone, green, blue and brown clays, and Fe oxyhydroxide.

COMMENTS: Piece 1 is glassy and contains iron-stained spherulites.

Core Photo



192-1185B-5R-2 **Section Top: 329.87 mbsf**

UNIT 2: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–4	1	<0.1	0.2	Euhedral to subhedral

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene, black oxides, and elongate olivine.

VESICLES: Nonvesicular.

COLOR: Mottled. Very light gray (N8) to medium light gray (N6).

STRUCTURE: Massive.

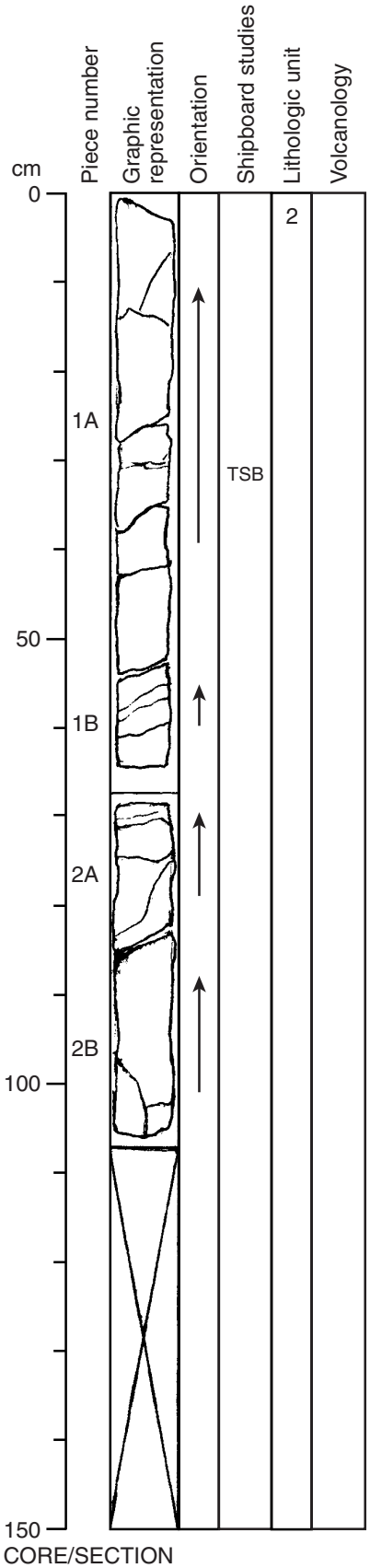
ALTERATION: Slight. Olivine phenocrysts are replaced by a dark-colored clay.

VEINS/FRACTURES: Sparsely veined. Veins are ≤1 mm wide and are filled with white calcite, pink-brown limestone, blue, green and brown clays, and Fe oxyhydroxide.

Description of thin section at 135-137 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-5R-3 **Section Top: 331.28 mbsf**

UNIT 2: APHYRIC BASALT

Pieces: 1A–2B

CONTACTS: None.

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene and pseudomorphs after olivine.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to medium gray (N5).

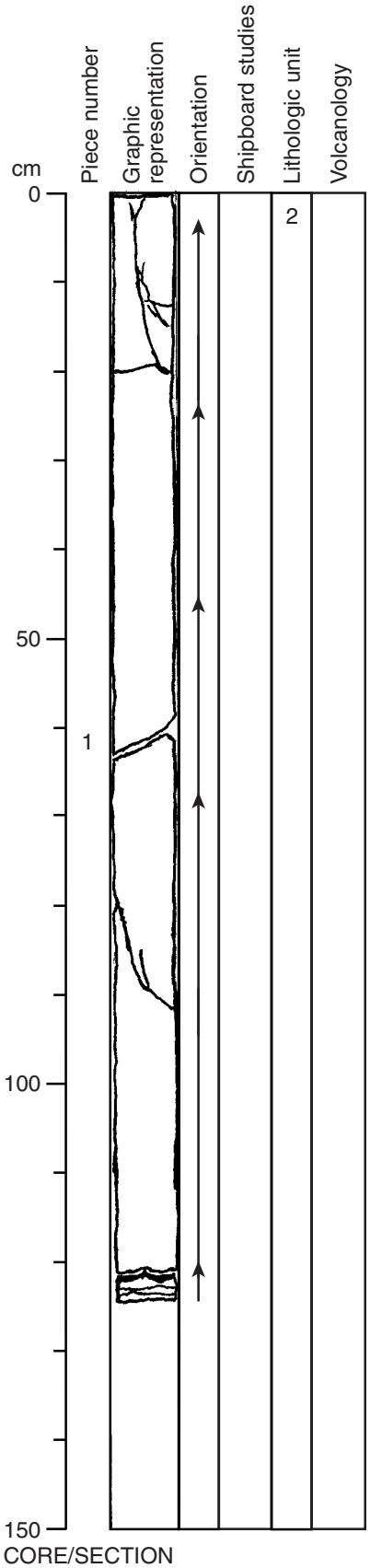
STRUCTURE: Massive.

ALTERATION: Slight; moderate near veins.

VEINS/FRACTURES: Sparsely to moderately veined. The veins (<1-3 mm wide) are filled with carbonate, and the largest veins contain green or brown clay.

Description of thin section at 32-34 cm

Core Photo



192-1185B-5R-4 **Section Top: 332.36 mbsf**

UNIT 2: APHYRIC BASALT

Piece: 1

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	<1	1.5	<0.5	~0.6	Subhedral to euhedral

GROUNDMASS: Fine grained with variolitic texture. Contains plagioclase, clinopyroxene and olivine.

VESICLES: Nonvesicular.

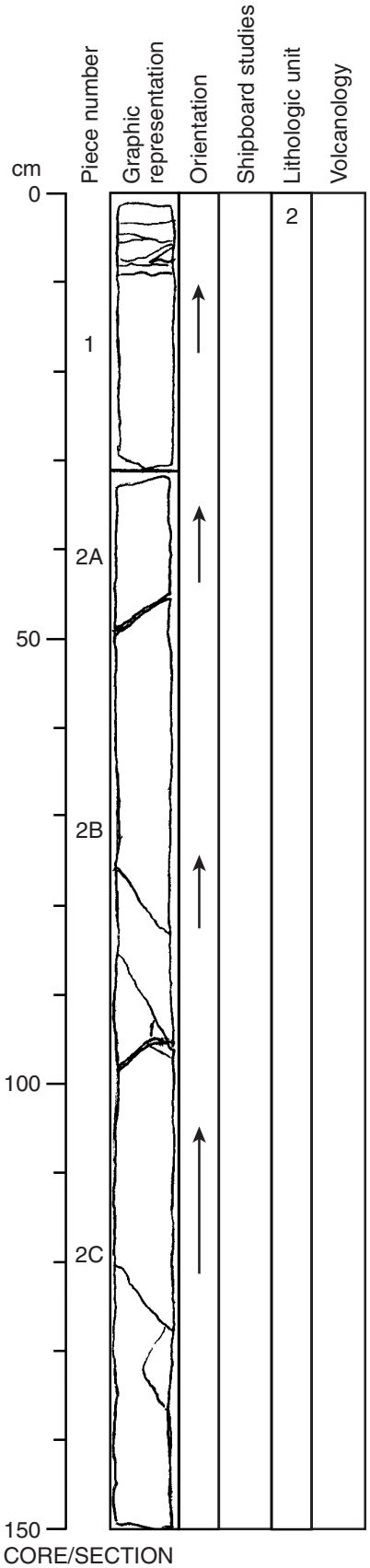
COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight; moderate near veins and fractures. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-4 mm wide and are filled with calcite, green and brown clay, and Fe oxyhydroxide.

Core Photo



192-1185B-5R-5 **Section Top: 333.63 mbsf**

UNIT 2: APHYRIC BASALT

Pieces: 1–2C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1	1.2	<0.5	0.8	Subhedral to euhedral

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene and olivine.

VESICLES: Nonvesicular.

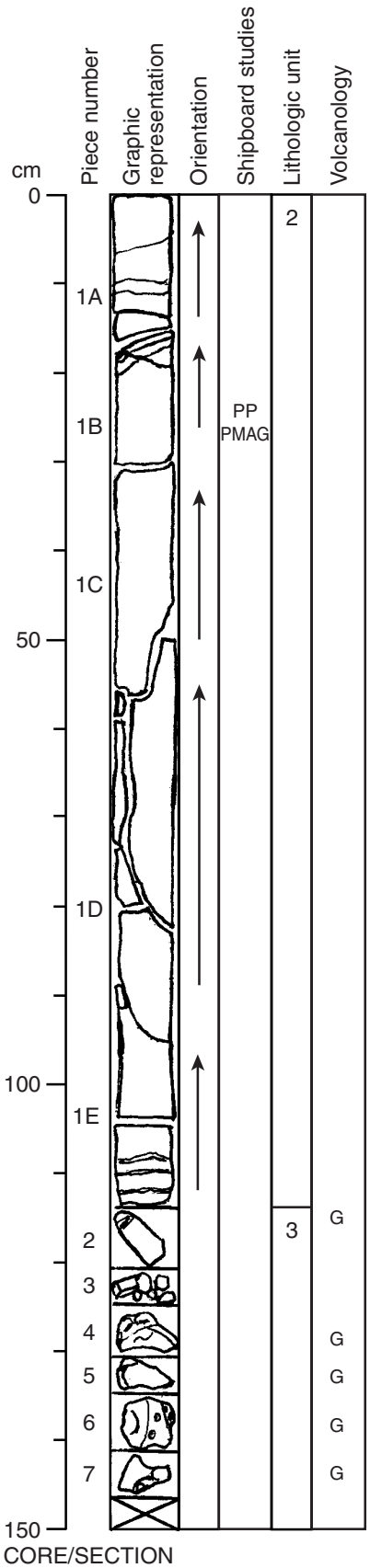
COLOR: Medium gray (N5) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight; moderate near veins. Olivine phenocrysts are replaced by dark green clay.

VEINS/FRACTURES: Highly veined at the top of the section to sparsely veined at the bottom. Veins are <1-3 mm wide and are filled with fibrous carbonate, green clay, and Fe oxyhydroxide.

Core Photo



192-1185B-5R-6 **Section Top: 335.13 mbsf**

UNIT 2: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1E

CONTACTS: Not recovered. The contact between Units 2 and 3 is inferred to be between Pieces 1E and 2.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<2	1.5	1	1	Subhedral to euhedral

Unaltered(?) olivine phenocrysts are observed in most of the section, except in the middle of Piece 1D.

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene and pseudomorphs after olivine.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1-15 mm wide and are filled with calcite; green or brown clay is present in the larger veins.

UNIT 3: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 2–7

CONTACTS: Not recovered. The contact between Units 2 and 3 is inferred to be between Pieces 1 and 2, and is marked by a sudden change from the massive structure of Unit 2 to the pillowed structure of Unit 3.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1	~0.1	~0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic. Spherulitic to glassy in Pieces 2 and 4–7.

VESICLES: Nonvesicular.

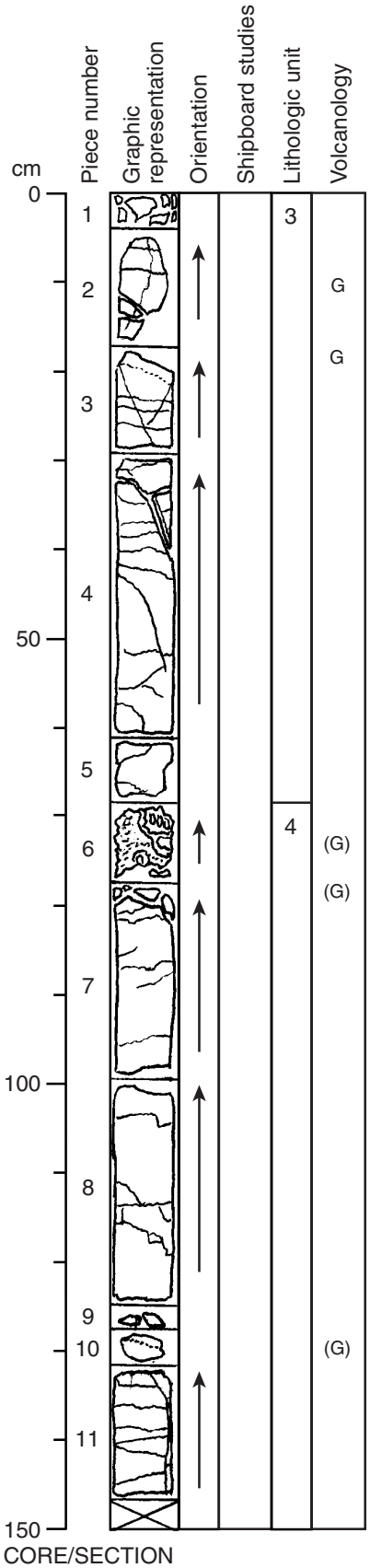
COLOR: Glass is grayish black (N2) to medium dark gray (N4) and the spherulitic zone is mottled pinkish gray (5YR 7/2).

STRUCTURE: Pillowed. Curved glassy rims are present on Pieces 2 and 4–7, and hyaloclastite (altered to green clay) forms part of Piece 4.

ALTERATION: Glassy rims are unaltered, but the spherulitic zone is moderately altered, with alteration making spherulites highly visible. Most olivine phenocrysts are replaced by orange Fe oxyhydroxide and clay, although olivine in the glassy areas appears unaltered. The hyaloclastite on Piece 4 is highly altered.

VEINS/FRACTURES: Moderately veined. Almost all pieces have veins (<1-4 mm wide); they are filled with carbonate, Fe oxyhydroxide, and green clay.

Core Photo



192-1185B-5R-7 **Section Top: 336.58 mbsf**

UNIT 3: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–5

CONTACTS: Not recovered. The contact between Units 3 and 4 is inferred to be between Pieces 5 and 6; the change in unit is defined by the appearance of a thick (>8 cm), altered hyaloclastite (Piece 6).

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–5	1.5	~0.1	~0.5	Subhedral to euhedral

Olivine phenocrysts are most abundant in the spherulitic zone, and are <1% in Piece 4 (fine grained).

GROUNDMASS: Glassy to spherulitic (Pieces 2, 3 and 5); fine grained (Piece 4).

VESICLES: Generally nonvesicular. Rare round vesicles (<1 mm) are filled with orange Fe-oxyhydroxide and clay.

COLOR: Glass is grayish black (N2) to medium dark gray (N4); spherulitic zone is mottled pinkish gray (5YR 7/2); fine-grained Piece 4 is light gray (N7).

STRUCTURE: Pillowed. Glassy rims and adjacent spherulitic zones are present in Pieces 2, 3 and 5.

ALTERATION: Slight to moderate; glass is unaltered. Olivine crystals are replaced by Fe oxyhydroxide and orange and dark green clay, with the exception of some unaltered olivine crystals in the glass.

VEINS/FRACTURES: Highly veined. The veins are <1-3 mm wide and are filled with green clay, Fe oxyhydroxide, and carbonate.

UNIT 4: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT AND HYALOCLASTITE

Pieces: 6–11

CONTACTS: Not recovered. The contact between Units 3 and 4 is inferred to be between Pieces 5 and 6; the change in unit is defined by the appearance of altered hyaloclastite (Piece 6).

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<2–3	1.5	0.1	~0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Piece 10 has a glassy margin.

VESICLES: Generally nonvesicular. Rare round vesicles (<0.5 mm) are filled with orange Fe oxyhydroxide and clay.

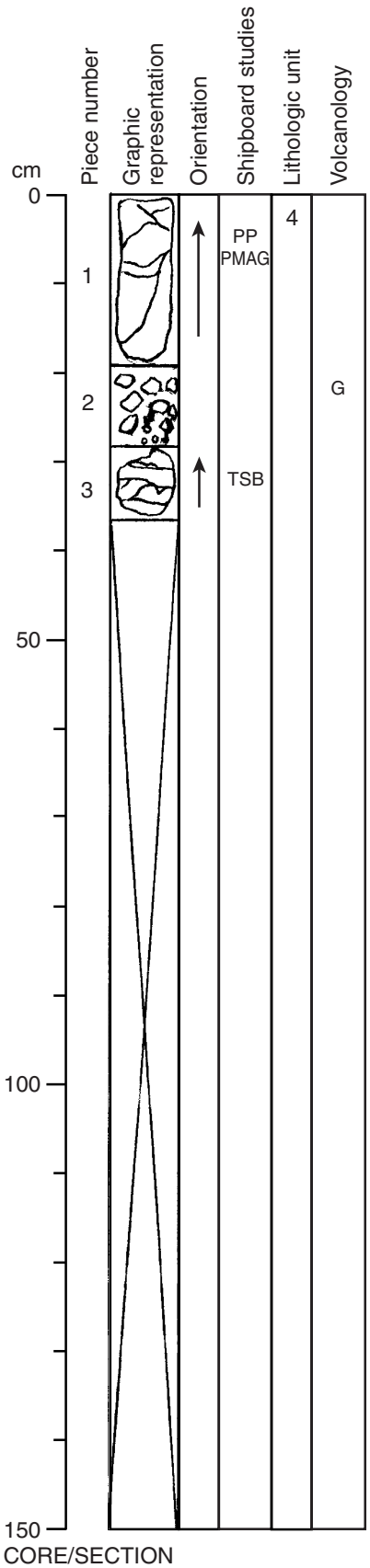
COLOR: Mottled pinkish gray (5YR 7/2) to light brownish gray at the bottom of Piece 11 (10YR 6/2).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine is replaced by orange Fe-oxyhydroxide and clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-11 mm wide and are filled with carbonate, green clay, and Fe oxyhydroxide.

Core Photo



192-1185B-5R-8 **Section Top: 338.04 mbsf**

UNIT 4: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–3

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<2	1.5	<1	~1	Euhedral to subhedral

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene and pseudomorphs after olivine.

VESICLES: Generally nonvesicular. Rare vesicles present.

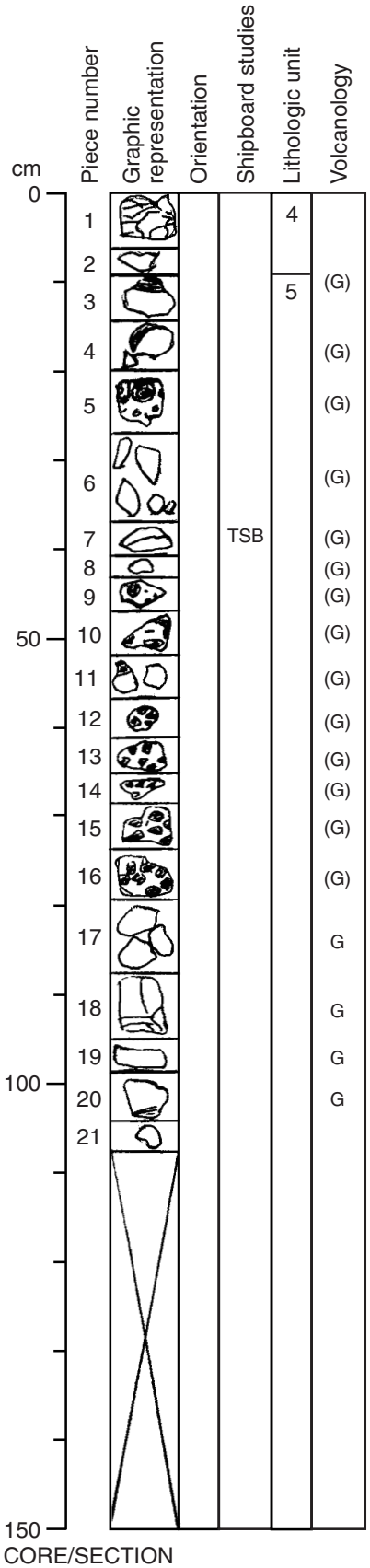
COLOR: Pale brown (10YR 6/3) to pinkish gray (5YR 7/2) to yellow (10YR 7/6).

STRUCTURE: Pillowed. Glass present in one fragment of Piece 2.

ALTERATION: Moderate. Olivine phenocrysts are replaced by brownish yellow clay.

VEINS/FRACTURES: Moderately to highly veined. Veins are <1-3 mm wide and are filled with calcite and brown clay.

Core Photo



192-1185B-6R-1 **Section Top: 338.40 mbsf**

UNIT 4: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–2

CONTACTS: Not recovered. The contact between Units 4 and 5 is inferred to be between Pieces 2 and 3, and is defined by the presence of hyaloclastite in Piece 3.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–3	1	<0.1	~0.5	Subhedral to euhedral

GROUNDMASS: Spherulitic to fine grained and variolitic. The spherulitic zone consists of coalesced spherulites that have olivine phenocrysts at their centers.

VESICLES: Nonvesicular. Rare round vesicles are <0.5 mm and filled with carbonate or Fe-oxyhydroxide and clay.

COLOR: Mottled reddish yellow (5YR 7/6) to pinkish gray (5YR 6/2).

ALTERATION: Moderate to high. Olivine phenocrysts are replaced by Fe-oxyhydroxide and clay. Alteration highlights some of the spherulites.

VEINS/FRACTURES: Piece 1 is moderately veined. Veins are <1-4 mm wide and are filled with green clay and carbonate.

UNIT 5: HYALOCLASTITE, BASALTIC BRECCIA, AND MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 3–21

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–3	1	<0.1	~0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic.

CONTACTS: Not recovered. The contact between Units 4 and 5 is inferred to be between Pieces 2 and 3.

VESICLES: Nonvesicular.

COLOR: Altered glass is grayish black (N2) to greenish black (5 GY 2/1); aphanitic basalt is medium light gray (N6) to medium dark gray (N4); clay matrix is reddish brown (5 YR 4/4).

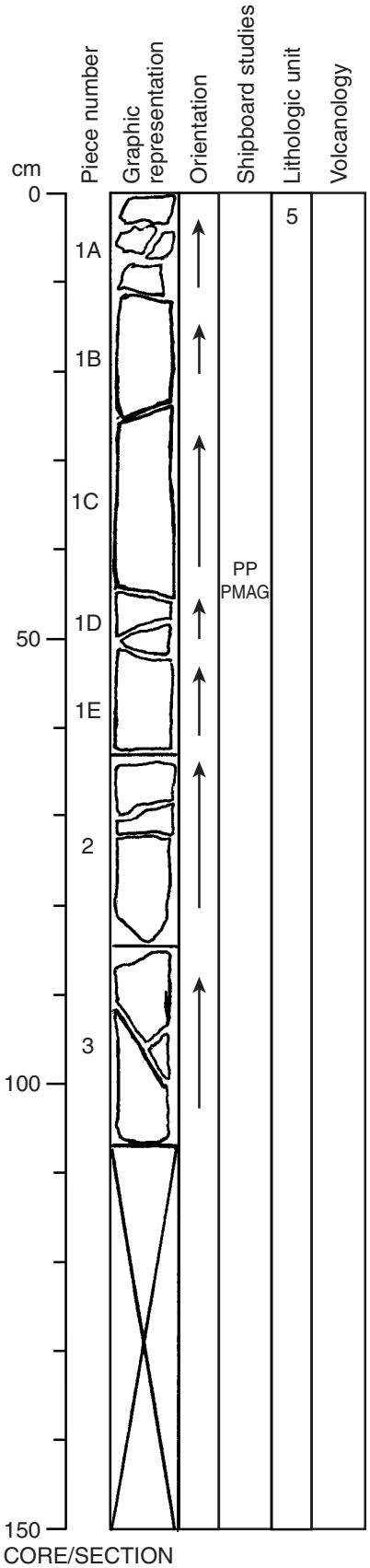
STRUCTURE: Angular clasts of altered glass and rare aphanitic basalt in a waxy clay matrix; locally cemented by coarse calcite. Pieces 17-21 are glassy to spherulitic pillow margins.

ALTERATION: High. Glass replaced by dark green clay; concentric internal structure visible. Pieces 17-21 are slightly altered.

COMMENTS: Spherulites are present within breccia clasts in Pieces 4, 7 and 10.

Description of thin section at 37-39 cm

Core Photo



192-1185B-6R-2 **Section Top: 339.47 mbsf**

UNIT 5: APHYRIC BASALT

Pieces: 1A–3

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture, but coarser than overlying units.

VESICLES: Nonvesicular.

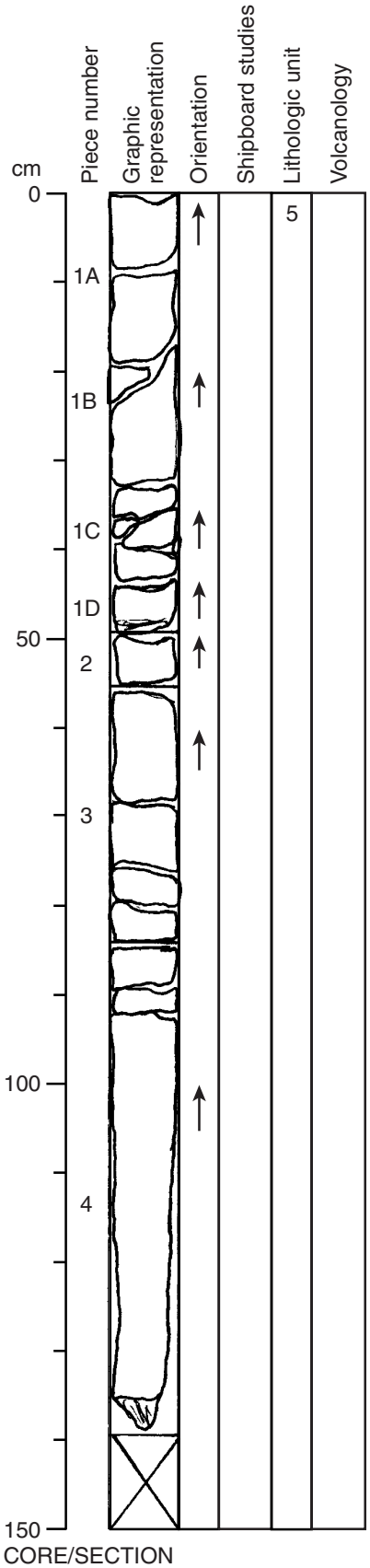
COLOR: Medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. Brown alteration halos are present near the veins.

VEINS/FRACTURES: Sparsely veined. Veins are 1–3 mm wide and are filled with carbonate and clay.

Core Photo



192-1185B-6R-3 **Section Top: 340.53 mbsf**

UNIT 5: APHYRIC BASALT

Pieces: 1A–4

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture. Plagioclase crystals radiate from some euhedral–subhedral olivine crystals. Also contains clinopyroxene and black oxides.

VESICLES: Nonvesicular.

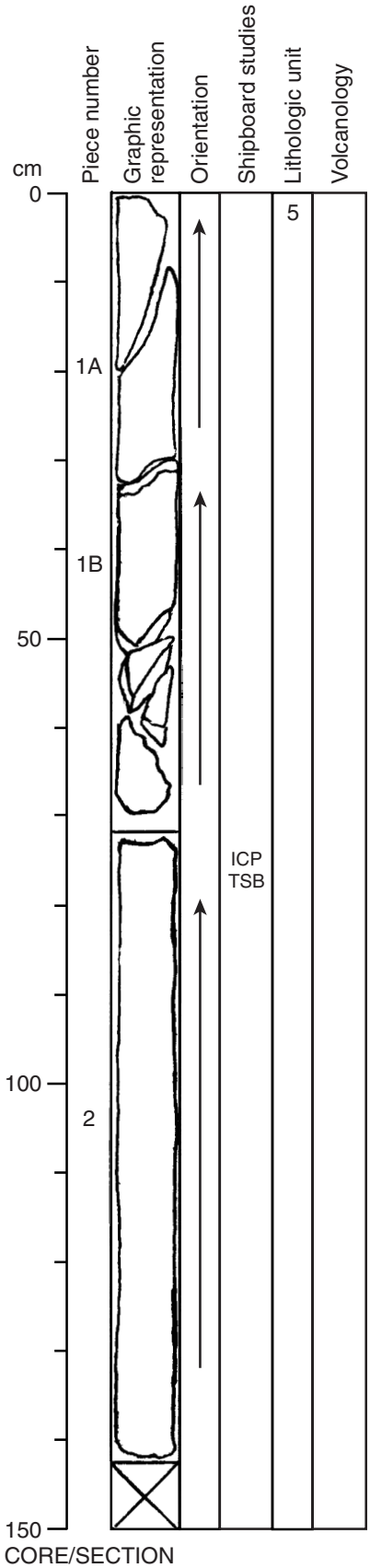
COLOR: Medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Generally slight. Euhedral olivine crystals are replaced by black-green clay, and brown oxidation halos are present around the veins.

VEINS/FRACTURES: Moderately veined. Veins are <1-3 mm wide and are filled with a white mineral (zeolite?).

Core Photo



192-1185B-6R-4 **Section Top: 341.92 mbsf**

UNIT 5: APHYRIC BASALT

Pieces: 1A–2

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

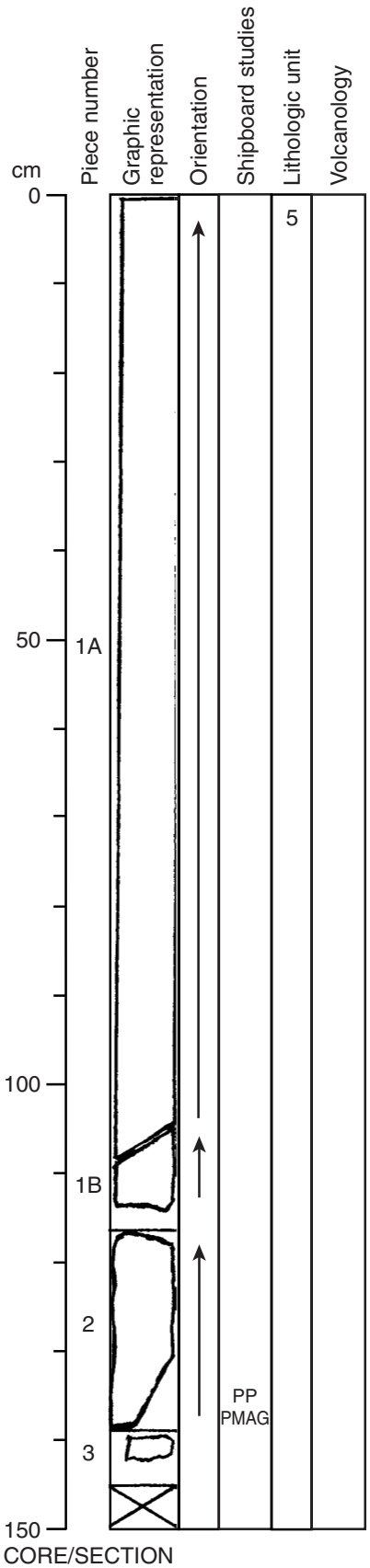
ALTERATION: Slight to moderate. Green clay is present in the groundmass, probably replacing mesostasis and/or olivine.

VEINS/FRACTURES: One vein on Piece 1A is 3–6 mm wide and filled with carbonate.

Description of thin section at 74-76 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-6R-5 **Section Top: 343.35 mbsf**

UNIT 5: APHYRIC BASALT

Pieces: 1A–3

CONTACTS: None.

GROUNDMASS: Fine grained; contains plagioclase, clinopyroxene, black oxides and small pseudomorphs after euhedral olivine crystals.

VESICLES: Nonvesicular.

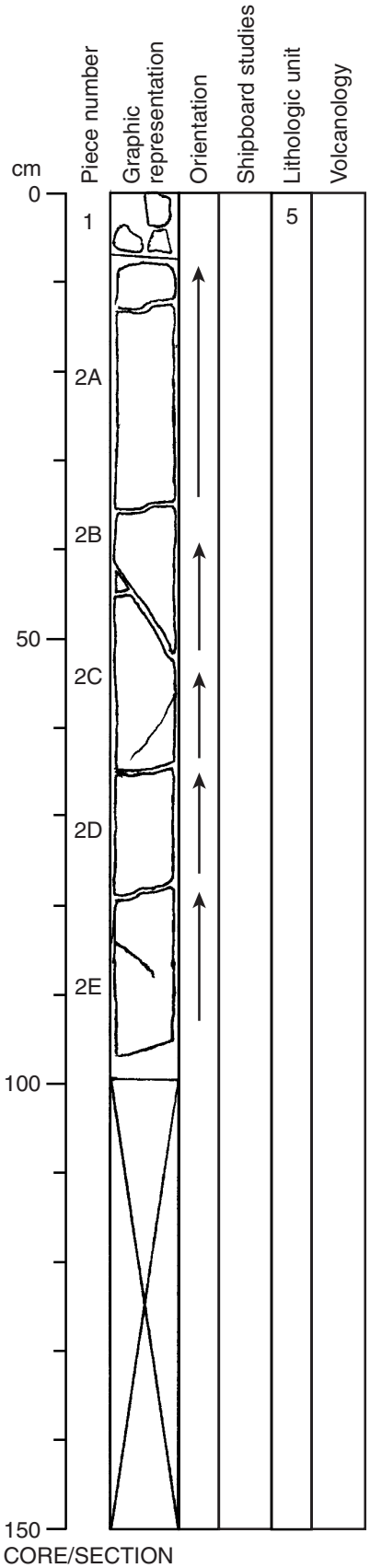
COLOR: Light gray (N7) to medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Some olivine is replaced by dark clay.

VEINS/FRACTURES: One vein; it is <1 mm wide and is filled with green-blue clay.

Core Photo



192-1185B-6R-6 **Section Top: 344.80 mbsf**

UNIT 5: APHYRIC BASALT

Pieces: 1–2E

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

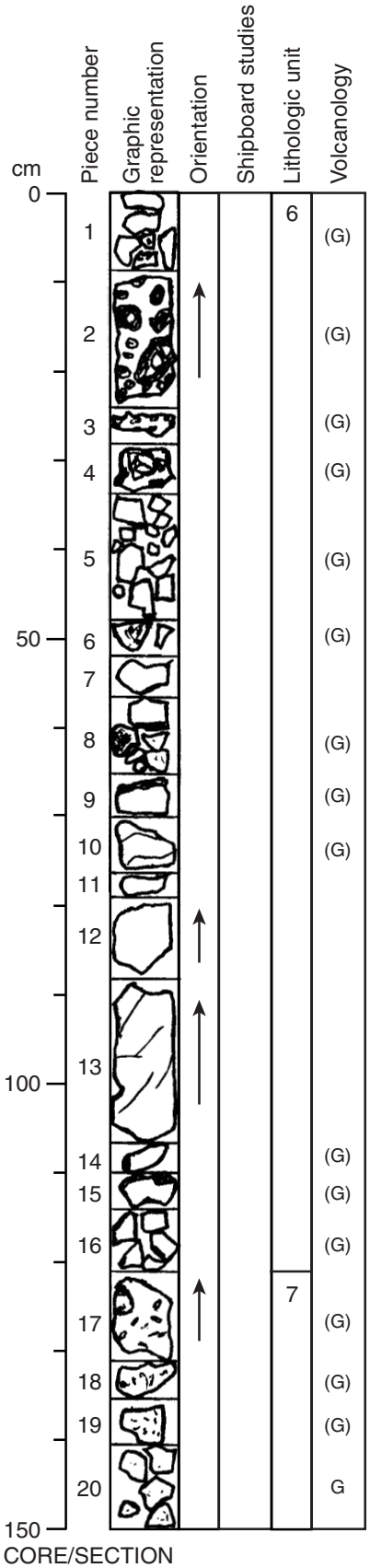
COLOR: Medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. Brown oxidation halos are present around the veins.

VEINS/FRACTURES: One vein, 2.5 mm wide and filled with carbonate and smectite, is present at the bottom of Piece 2E.

Core Photo



192-1185B-7R-1 **Section Top: 348.10 mbsf**

UNIT 6 : MODERATELY OLIVINE-PHYRIC BASALT AND HYALOCLASTITE

Pieces: 1–16

CONTACTS: Not recovered. The contact between Units 5 and 6 is inferred to be at the top of this section and the contact between Units 6 and 7 is inferred to be between Pieces 16 and 17.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–4	1.1	0.3	0.5	Euhedral

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Dusky yellowish green (10GY 3/2) to pale red purple (5RP 6/2) in Pieces 1–10. Grayish orange (10YR 7/4) to dark yellowish orange (10YR 6/6) in Pieces 7–16.

STRUCTURE: Brecciated and pillowed. Fresh glass is present in Piece 8.

ALTERATION: Slight to complete. Alteration highlights spherulites close to pillow margins.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1 mm wide and are filled with carbonate.

COMMENTS:
Pieces 1–6: Brecciated, rubbly material containing altered basaltic glass cemented by carbonate and clay.
Pieces 7–10: Small fragments of aphanitic basalt with carbonate and green clay attached.
Pieces 11–16: Highly altered aphanitic basalt.

UNIT 7: SPARSELY OLIVINE-PHYRIC BASALT AND HYALOCLASTITE

Pieces: 17–20

CONTACTS: Not recovered. The contact between Units 6 and 7 is inferred to be between Pieces 16 and 17.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2	1.3	0.2	0.6	Euhedral

GROUNDMASS: Aphanitic (basalt).

VESICLES: Nonvesicular.

COLOR: Grayish green (10G 4/2) to grayish orange (10YR 7/4).

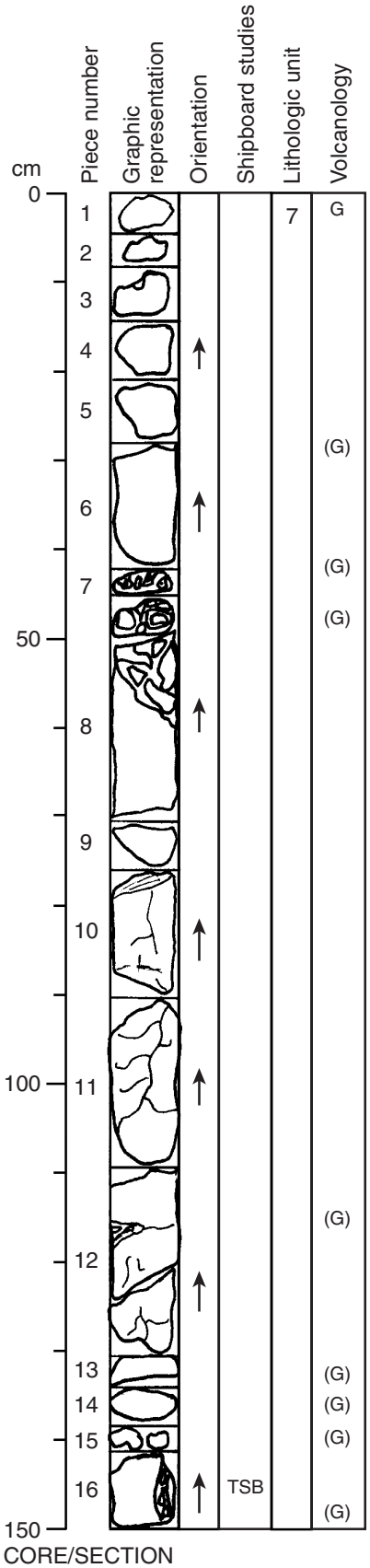
STRUCTURE: Brecciated.

ALTERATION: High to complete. Alteration has highlighted the spherulites.

VEINS/FRACTURES: None seen in basalt (Piece 20).

COMMENTS: Pieces 17–19 are hyaloclastite containing aphanitic basalt clasts and altered glass.

Core Photo



192-1185B-7R-2 **Section Top: 349.60 mbsf**

UNIT 7: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	3–5	2	0.5	1	Subhedral

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

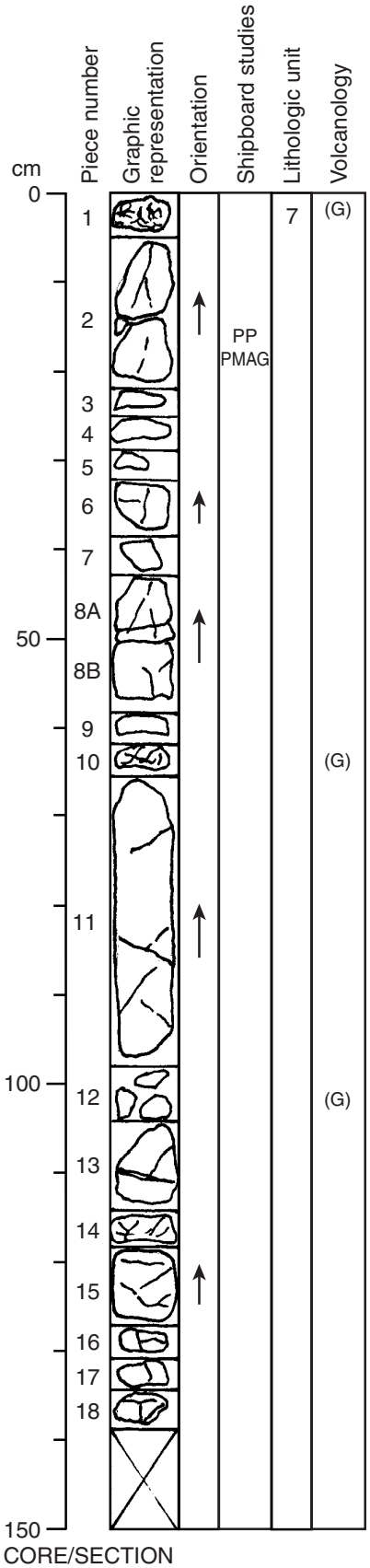
COLOR: Pale yellowish brown (10YR 6/2) to light brown (5YR 5/6).

STRUCTURE: Generally massive and brecciated. A chilled margin is present in Piece 1.

ALTERATION: Moderate to complete.

VEINS/FRACTURES: Moderately veined. Vein widths range from <1 to >10 mm (both sides of the vein are not present). The veins are filled with crystalline and microcrystalline carbonate and clay (replacing glass). Pieces 1 and 7, the tops of Pieces 6 and 8, the middle of Piece 12, and the side of Piece 16 contain veins filled with fragments of altered basalt and glass. Piece 7 is entirely composed of altered glass cemented with carbonate.

Core Photo



192-1185B-7R-3 **Section Top: 351.10 mbsf**

UNIT 7: MODERATELY OLIVINE-PHYRIC BASALT AND HYALOCLASTITE

Pieces: 1–18

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–6	2	0.5	0.8	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

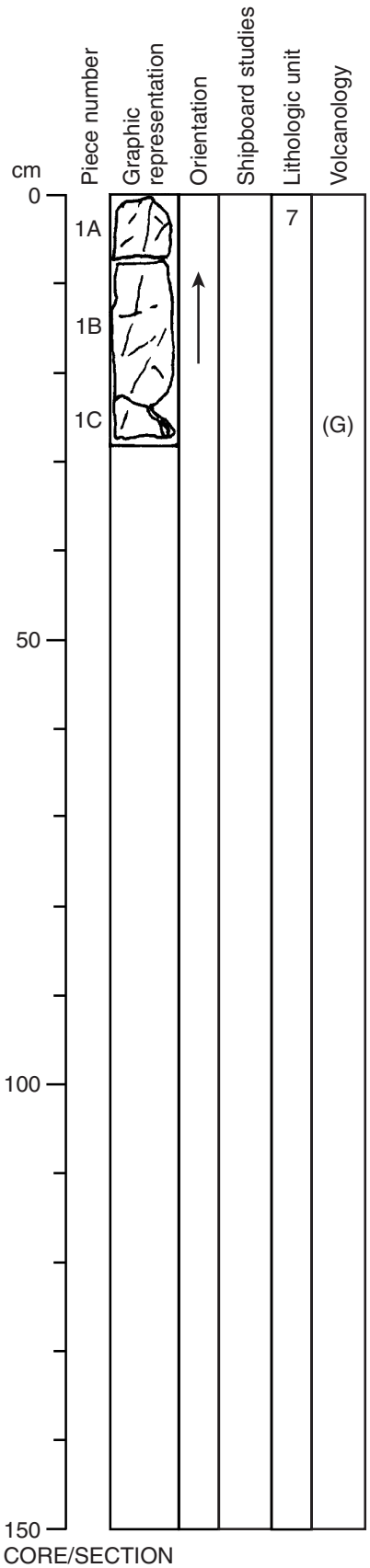
COLOR: Dark yellowish brown (10YR 4/2) to grayish orange (10YR 7/4).

STRUCTURE: Pillowed. Glass is present in Pieces 10 and 12, and in the hyaloclastite in Piece 1.

ALTERATION: High; pervasive alteration of the groundmass and olivine phenocrysts.

VEINS/FRACTURES: Moderately veined. Veins are <1-4 mm wide and are filled with carbonate and green clay. Black oxides are concentrated near veins

Core Photo



192-1185B-7R-4 **Section Top: 352.49 mbsf**

UNIT 7: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1C

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5–10	1	0.3	0.5	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture (e.g., Piece 1A).

VESICLES: Nonvesicular.

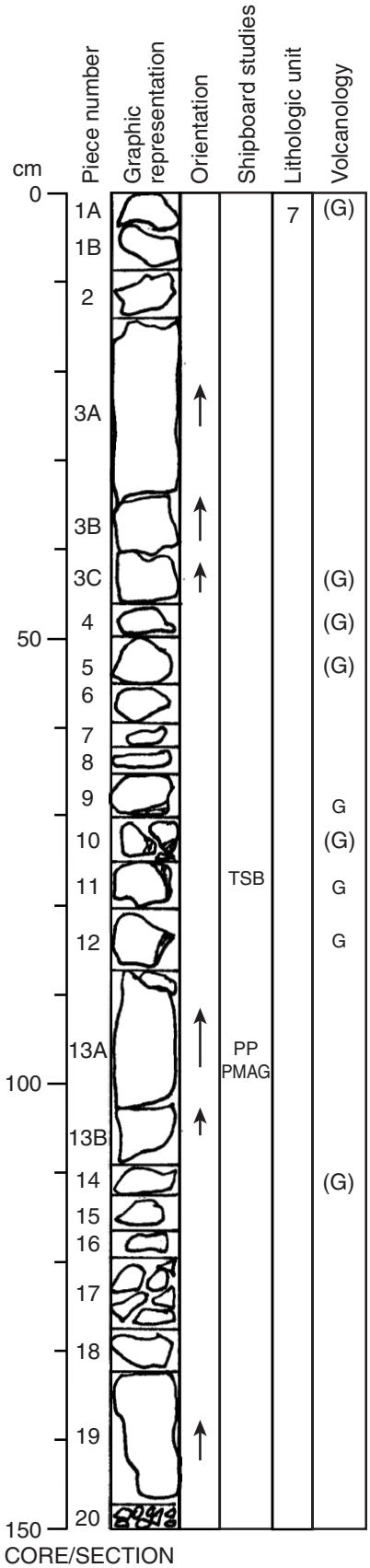
COLOR: Light gray (N6) to grayish orange (10YR 7/4).

STRUCTURE: Pillowed. An altered glassy margin is present at the bottom of Piece 1C.

ALTERATION: Moderate to high. Olivine phenocrysts are replaced by yellow-brown clay. The glassy margin (Piece 1C) is the most altered area.

VEINS/FRACTURES: Moderately veined. Veins are <1-3 mm wide and are filled with carbonate and green clay.

Core Photo



192-1185B-8R-1 **Section Top: 357.70 mbsf**

UNIT 7: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–20

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	3	2	0.5	1	Euhedral

GROUNDMASS: Aphanitic to fine grained.

VESICLES: Nonvesicular.

COLOR: Medium yellowish brown (10YR 5/4) to medium light gray (N6).

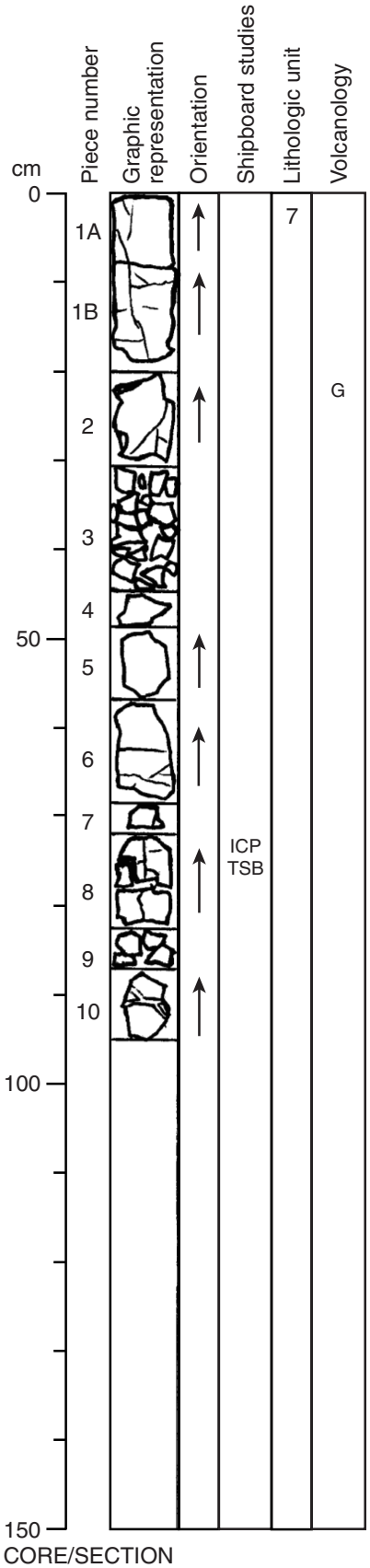
STRUCTURE: Pillowed. Glassy margins are present on Pieces 10–12.

ALTERATION: Moderate to high. Brown halos occur around veins. Alteration is pervasive throughout this section.

VEINS/FRACTURES: Sparsely veined. Veins are <1-4 mm wide and are filled with carbonate and brown clay.

Description of thin section at 76-78 cm

Core Photo



192-1185A-8R-2 **Section Top: 359.20 mbsf**

UNIT 7: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–10

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	3–5	0.9	0.5	0.7	Euhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Pillowed. A glassy margin is present at the top of Piece 2.

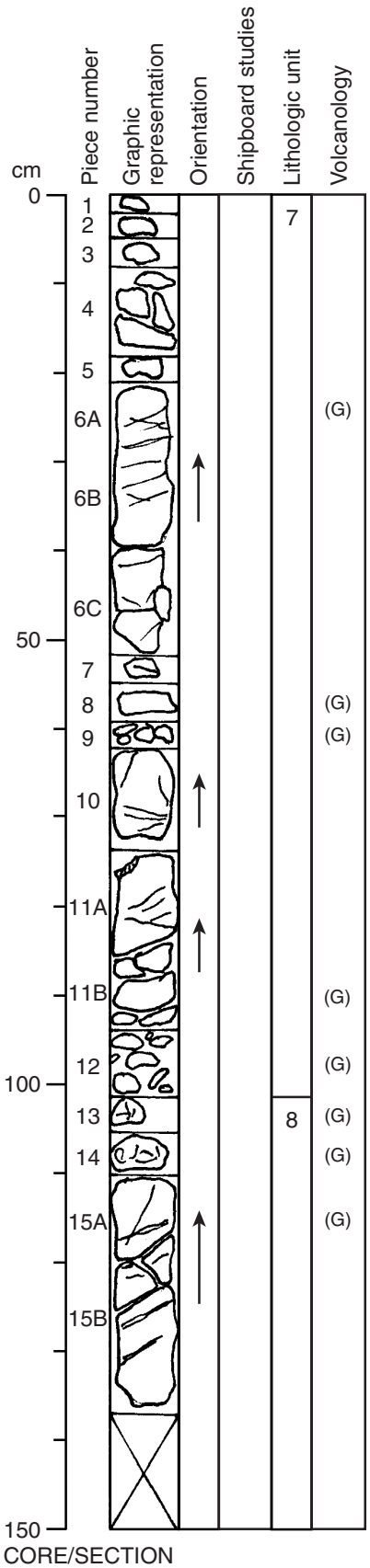
ALTERATION: Moderate. Olivine phenocrysts are replaced by green and yellow-brown clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-1.5 mm wide and are filled with carbonate.

Description of thin section at 73-76 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-9R-1 **Section Top: 367.30 mbsf**

UNIT 7: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–12

CONTACTS: Not recovered. The contact between Units 7 and 8 is inferred to be between Pieces 12 and 13.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–2	1.8	0.5	1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained, with variolitic texture in the fine-grained regions.

VESICLES: Nonvesicular.

COLOR: Dark yellowish orange (10YR 6/6) to dark yellow brown (10YR 4/2).

STRUCTURE: Pillowed. Glassy margins are present on Pieces 6, 8, and 11B.

ALTERATION: Moderate to high. Olivine phenocrysts are replaced by yellow-brown clay, and the glass is totally replaced by green and brown clay.

VEINS/FRACTURES: Highly veined. Veins are <1-6 mm wide and are filled with carbonate and clay.

UNIT 8: MODERATELY OLIVINE-PYHYRIC BASALT AND HYALOCLASTITE

Pieces: 13–15B

CONTACTS: Not recovered. The contact between Units 7 and 8 is inferred to be between Pieces 12 and 13.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–4	1.5	0.4	0.9	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained, with variolitic texture in fine-grained regions.

VESICLES: Nonvesicular.

COLOR: Moderate yellowish brown (10YR 5/4) to brownish gray (5YR 4/1).

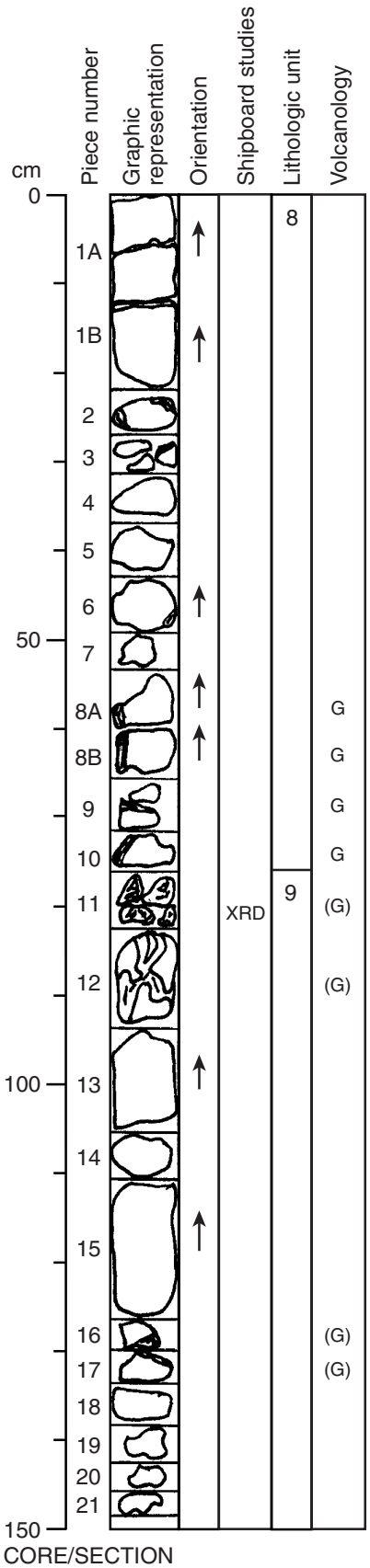
STRUCTURE: Pillowed. Glass is present in Pieces 13–15A.

ALTERATION: High. Brown halos are present around veins and pillow margins. Olivine phenocrysts are totally replaced by green and yellow-brown clay.

VEINS/FRACTURES: Moderately to highly veined. Veins range are <1-5 mm wide and are filled with carbonate and green clay.

COMMENTS: Pieces 13 and 14 are hyaloclastite that contains fragments of altered glass and aphanitic basalt.

Core Photo



192-1185B-9R-2 **Section Top: 368.67 mbsf**

UNIT 8: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–10

CONTACTS: Not recovered. The contact between Units 8 and 9 is inferred to be between Pieces 10 and 11.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	3–5	2	0.5	1	Euhedral

GROUNDMASS: Aphanitic to fine grained, with variolitic texture in fine-grained regions.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to moderate yellowish brown (10YR 5/4).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are replaced by clay.

VEINS/FRACTURES: Moderately to highly veined. Veins are <1-5 mm wide and are filled with carbonate and clay.

UNIT 9: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 11–21

CONTACTS: Not recovered. The contact between Units 8 and 9 is inferred to be between Pieces 10 and 11.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	3–5	2	0.5	1	Euhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7).

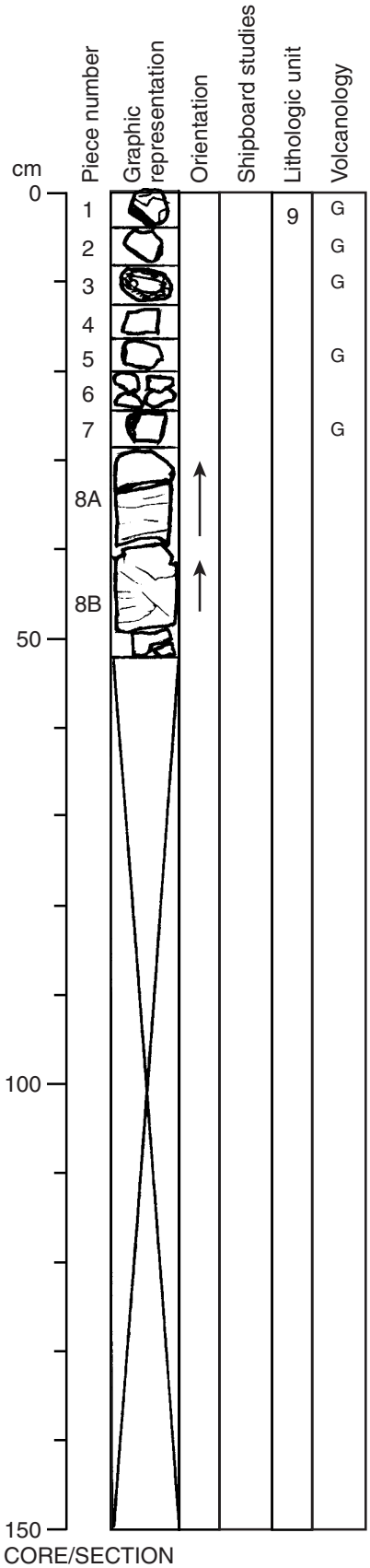
STRUCTURE: Pillowed. Altered glassy margins are present in Pieces 16–17.

ALTERATION: Moderate.

VEINS/FRACTURES: Moderately veined. Veins are <1-4 mm wide and are filled with carbonate.

COMMENTS: Pieces 11 and 12 are hyaloclastite containing angular fragments of altered glass cemented by carbonate.

Core Photo



192-1185B-9R-3 **Section Top: 370.16 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–8B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2	1	0.3	0.6	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained, with variolitic texture in fine-grained regions.

VESICLES: Nonvesicular.

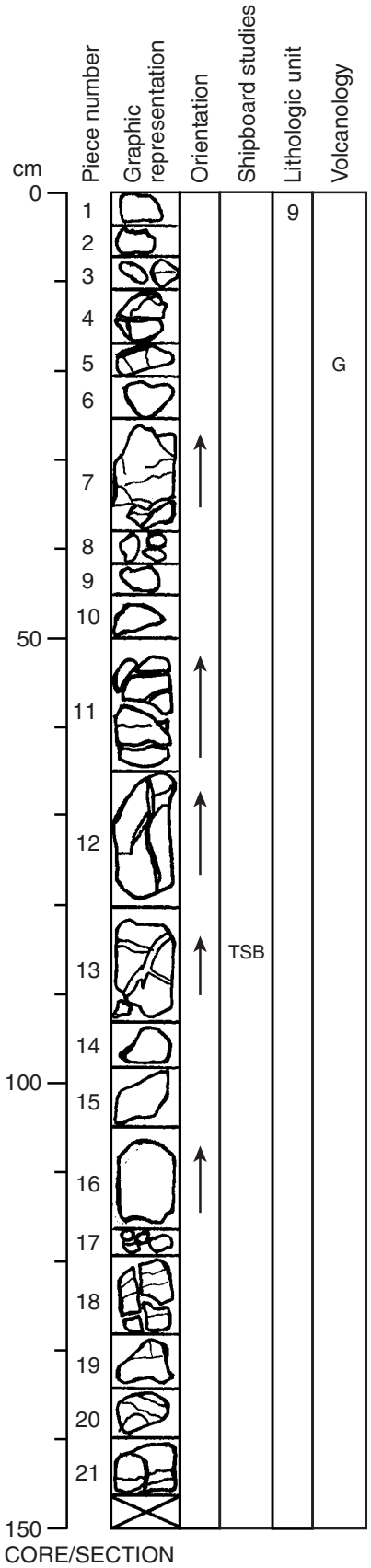
COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Pillowed. Glassy margins are present on Pieces 1–3, 5 and 7.

ALTERATION: Moderate. Olivine crystals are completely replaced by green and brown clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-3 mm wide and are filled with carbonate and green clay.

Core Photo



192-1185B-10R-1 **Section Top: 376.90 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–21

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–2	1	<0.1	0.2	Euhedral to subhedral

GROUNDMASS: Aphanitic. Piece 12 has a high concentration of spherulites. Small, poorly defined spherulites are present in a cluster near the glassy rim of Piece 5. Spherulites are sparse throughout the rest of the section. The groundmass grain size increases to fine grained in Piece 21.

VESICLES: Nonvesicular.

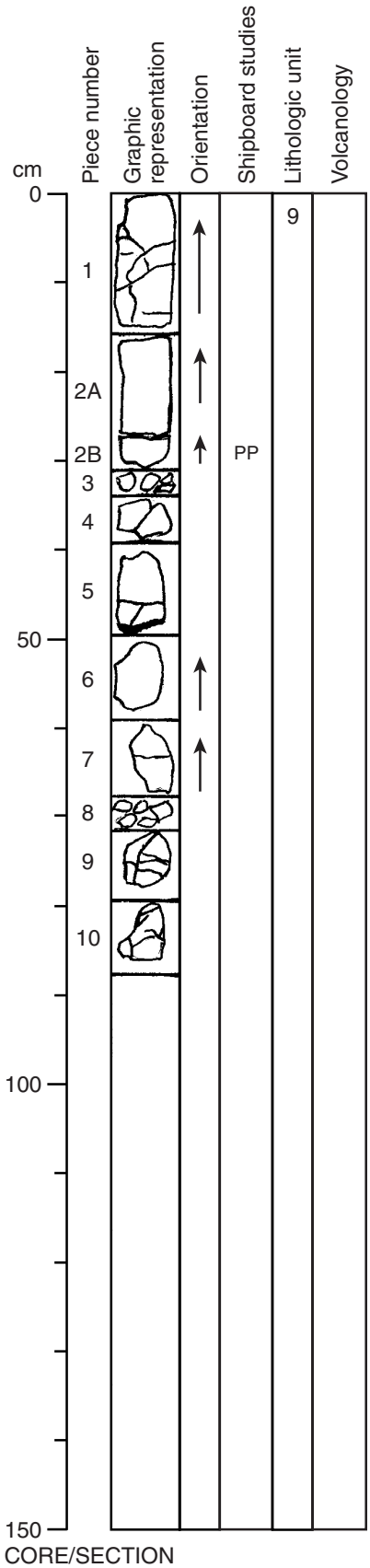
COLOR: Grayish orange (10YR 7/4), moderate yellowish brown (10YR 5/4), dark yellowish orange (10YR 6/6), medium light gray (N6), and light gray (N7).

STRUCTURE: Pillowed. A glassy rim is present in Piece 5.

ALTERATION: High to complete. Most of the section is stained with Fe oxyhydroxide, and olivine phenocrysts are replaced by Fe oxyhydroxide and clay. The glassy rim in Piece 5 is slightly altered.

VEINS/FRACTURES: Highly veined. Veins are <1-9 mm wide and are filled with carbonate, green and brown clay, and Fe oxyhydroxide.

Core Photo



192-1185B-10R-2 **Section Top: 378.36 mbsf**

UNIT 9: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	≤1	2	~0.1	~1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained areas have variolitic texture.

VESICLES: Generally nonvesicular. Rare round vesicles, 0.1-0.5 mm in diameter, are filled with green clay.

COLOR: Light gray (N7) to medium light gray (N6). Pieces 7 and 10 are brownish gray (5YR 4/1).

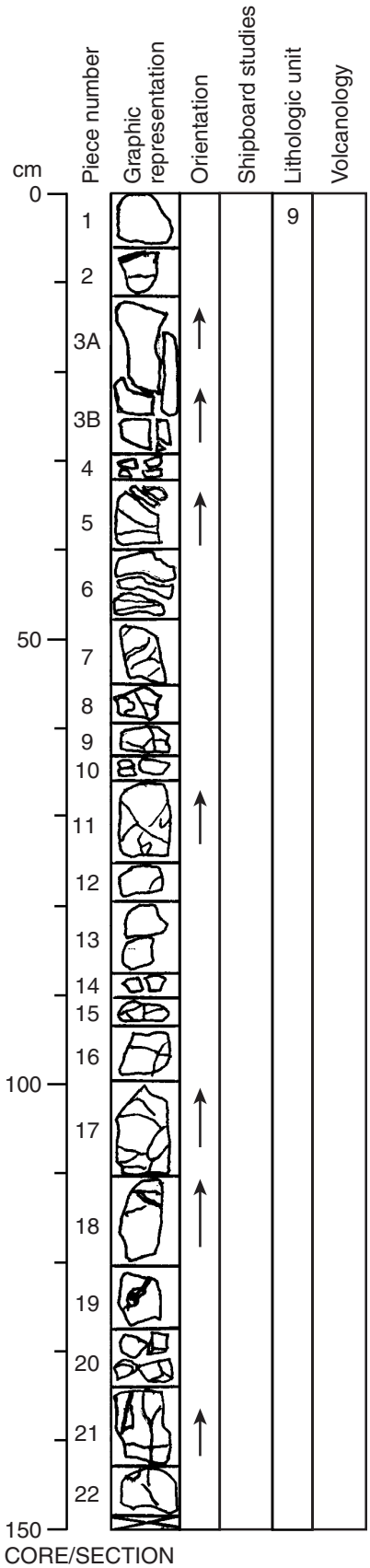
STRUCTURE: Pillowed. Aphanitic groundmass in some pieces suggests proximity to cooling unit margins, although no glassy rims are present.

ALTERATION: Moderate; high near veins. Olivine phenocrysts are completely replaced by Fe oxyhydroxide and clay.

VEINS/FRACTURES: Pieces 1, 2, and 7–10 are moderately to highly veined; Pieces 3–6 are sparsely veined. Veins are <1-2 mm wide and are filled with green clay, Fe oxyhydroxide and carbonate.

COMMENTS: Equant and angular miarolitic cavities constitute ~2% of the rock. They are <1-3 mm in size and are sometimes interconnected. They are filled with carbonate, green clay, and Fe oxyhydroxide.

Core Photo



192-1185B-11R-1 **Section Top: 386.50 mbsf**

UNIT 9: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–22

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Plagioclase:	<<1	1.5	1	~1	Subhedral, tabular laths
Olivine:	<1–2	2	<0.5	~1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Aphanitic regions contain spherulites; fine-grained regions have variolitic texture.

VESICLES: Nonvesicular. Rare round vesicles (<1 mm) are filled with clay and Fe oxyhydroxide.

COLOR: Light gray (N7) to medium light gray (N6) on moderately altered pieces; mottled light reddish brown (5YR 6/3) to reddish yellow (5YR 6/6) on highly altered pieces.

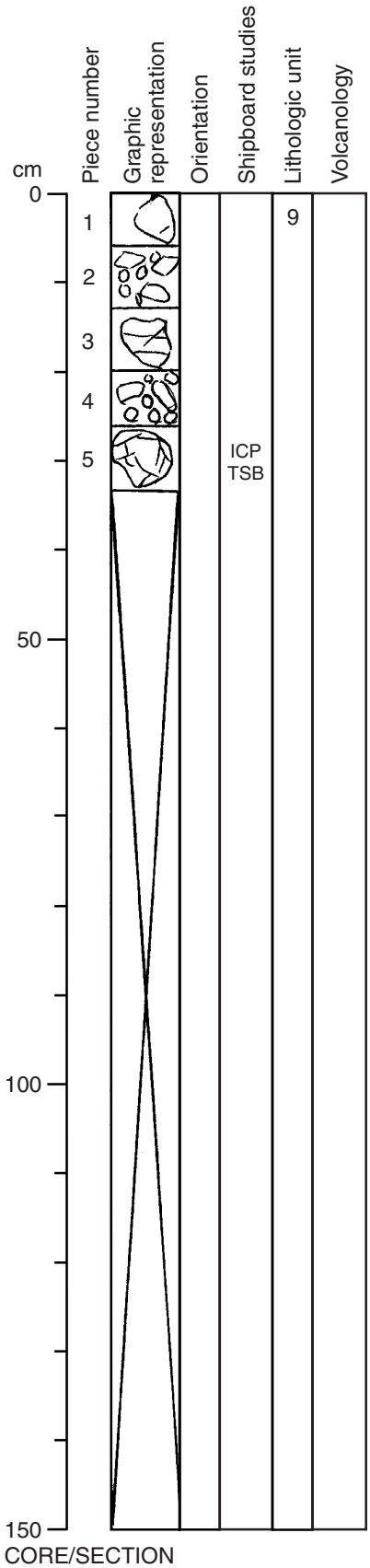
STRUCTURE: Pillowed. Presence of pillows is inferred from grain size variations and the presence of spherulitic zones (e.g., Pieces 11 and 21).

ALTERATION: Moderate (Pieces 1–3 and 5–6) to high (Pieces 4 and 7–22). Smaller pieces are generally more highly altered. Olivine phenocrysts are completely replaced by clay and Fe oxyhydroxide; plagioclase phenocrysts are unaltered. Alteration highlights the spherulitic regions and the olivine phenocrysts.

VEINS/FRACTURES: Sparsely to highly veined. Pieces 7, 11, 17, and 21 are the most highly veined. Veins are <1-2 mm wide and are filled with carbonate, green clay, white mineral (zeolite?), and Fe oxyhydroxide.

COMMENTS: Angular and equant miarolitic cavities are present in variable abundance (e.g., Pieces 3, 9, and 21). They are <1 mm and are filled with dark green clay and/or Fe oxyhydroxide.

Core Photo



192-1185B-11R-2 **Section Top: 388.00 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1	~1	<<1	<1	Euhedral to subhedral; commonly in glomerocrysts

The abundance of olivine phenocrysts decreases toward the bottom of the section.

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to very pale brown (10YR 7/4).

STRUCTURE: Massive. This section comprises small pieces only, and no glassy margins or grain size variations are present.

ALTERATION: Slight to moderate. Olivine phenocrysts are stained by Fe oxyhydroxide at the top of the section and replaced by Fe oxyhydroxide or green-black clay toward the bottom of the section.

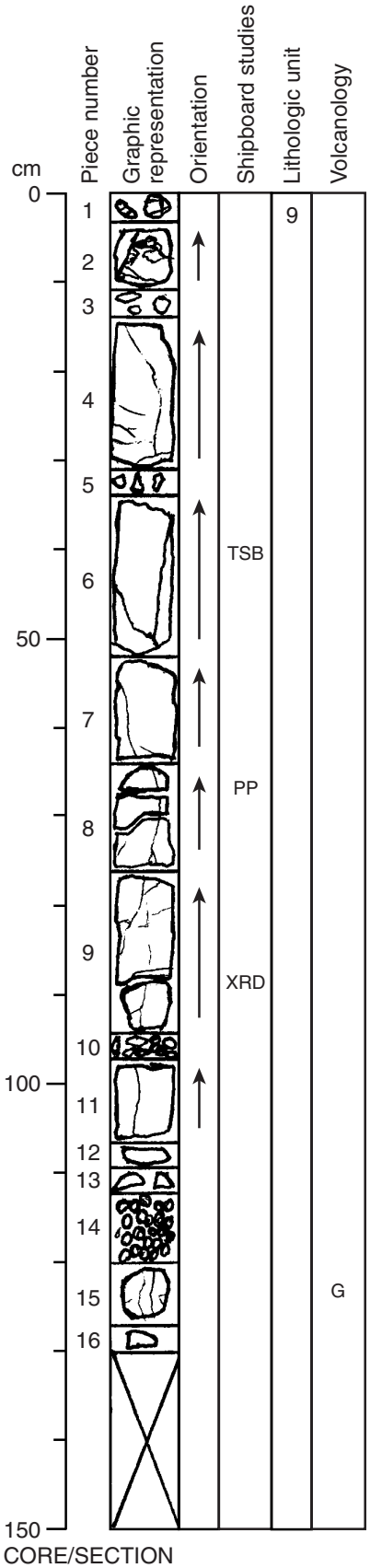
VEINS/FRACTURES: Moderately veined. Veins are <1-2 mm wide and are filled with carbonate and green and brown clay.

COMMENTS: Sparse miarolitic cavities are filled with green clay or carbonate (e.g., Piece 1).

Description of thin section at 28-32 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-12R-1 **Section Top: 396.10 mbsf**

UNIT 9: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Plagioclase:	<<1	1			Subhedral, tabular laths
Olivine:	<1–2	2	0.1	~1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Aphanitic regions have spherulitic texture; fine-grained regions have variolitic texture.

VESICLES: Nonvesicular. Rare round vesicles (<0.5–1.5 mm) are filled with clay and carbonate.

COLOR: Light gray (N7) to medium light gray (N6) on moderately altered pieces; light reddish brown (5YR 6/3) to reddish brown (5YR 6/6) on highly altered pieces.

STRUCTURE: Pillowed. Pillows inferred from grain size variations from aphanitic to fine grained in Pieces 4 and 15; Piece 15 also has a thin glassy rim.

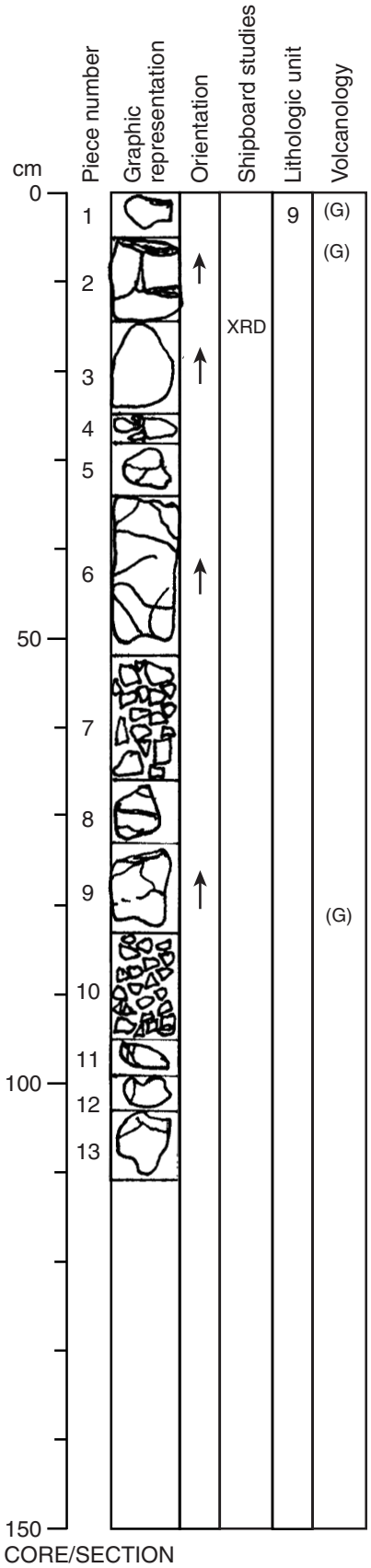
ALTERATION: Moderate to high. Small pieces are generally more altered than large pieces. Alteration highlights the spherulitic and variolitic textures and olivine phenocrysts. Plagioclase phenocrysts are relatively unaltered.

VEINS/FRACTURES: Moderately to highly veined. Pieces 4 and 6 have the most veins. Veins are <1-8 mm wide and are filled with dark green clay, carbonate, and Fe oxyhydroxide.

COMMENTS: Angular and equant miarolitic cavities are present in several pieces (e.g., Pieces 4–9). They are <1-2 mm in size; some cavities are interconnected. They are filled with green clay, carbonate, and Fe oxyhydroxide.

Description of thin section at 40-44 cm

Core Photo



192-1185B-13R-1 **Section Top: 400.20 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–2	1.2	0.5	0.8	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained. Aphanitic regions contain spherulites; fine-grained regions have variolitic texture.

VESICLES: Nonvesicular. Rare round vesicles (~1 mm) are filled with yellow-brown clay.

COLOR: Dark yellowish brown (10YR 4/2) to dark yellowish orange (10YR 6/6).

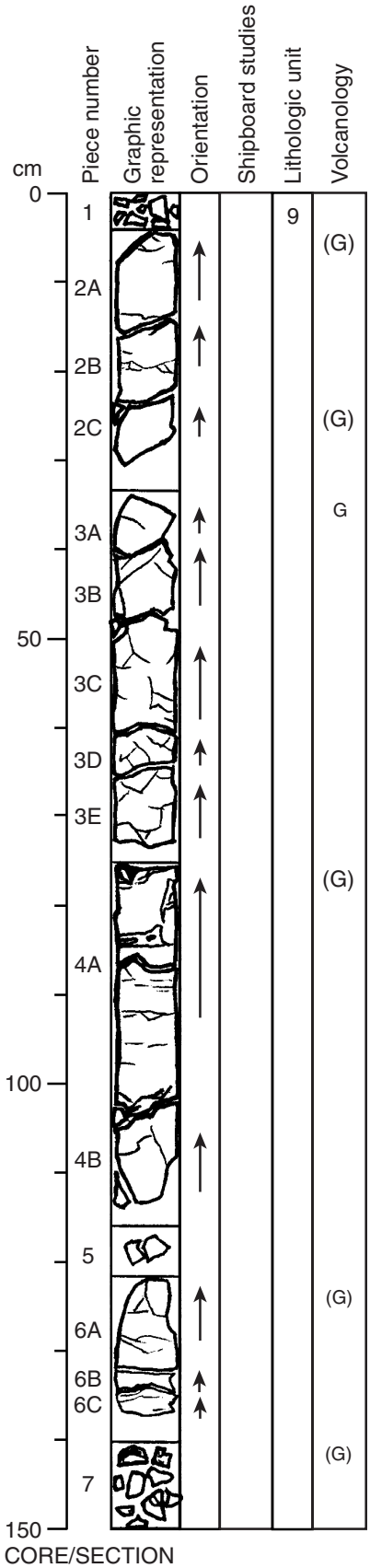
STRUCTURE: Pillowed. Altered glassy margins are present on Pieces 1–3.

ALTERATION: High. Alteration highlights olivine phenocrysts, which are replaced by yellow-brown clay. Glassy margins are totally replaced by green, yellow and brown clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-4 mm wide and are filled with a white mineral (zeolite?) and green clay.

COMMENTS: Irregular to subrounded miarolitic cavities (~1 mm) are present in Pieces 1, 5, and 13. They are moderately abundant in bands within the fine-grained pillow interior and are filled with dark green clay.

Core Photo



192-1185B-14R-1 **Section Top: 405.70 mbsf**

UNIT 9: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–7

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	5	1	0.3	0.8	Euhedral to subhedral

GROUNDMASS: Aphanitic to fine grained.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to moderate yellowish brown (10YR 5/4).

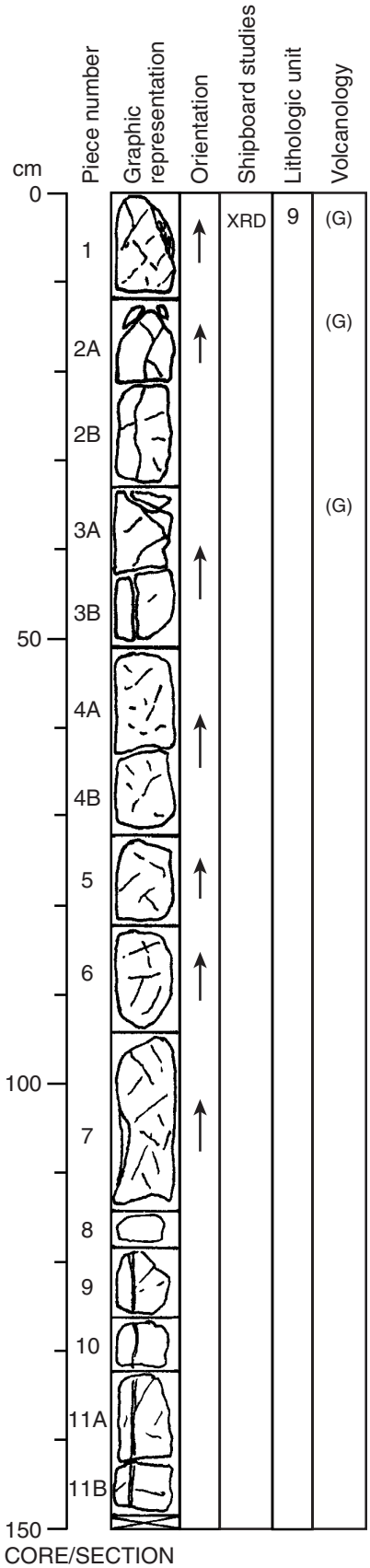
STRUCTURE: Pillowed. Glassy margins are observed on Pieces 2A, 2C, 3A, 4A, 6A, and 7.

ALTERATION: High. Olivine phenocrysts are replaced by yellow-brown clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-13 mm wide and are filled with carbonate and black clay.

COMMENTS: Pieces 2A, 4A, 6A, and 7 have brecciated margins that contain altered glass with carbonate cement.

Core Photo



192-1185B-14R-2 **Section Top: 407.20 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–11B

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–2	1.5	0.5	0.8	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Generally nonvesicular. Rare round vesicles (~1 mm) are filled with green and yellow-brown clay.

COLOR: Pale yellowish brown (10YR 6/2) to dark yellowish orange (10YR 6/6), except Pieces 9–11B, which are olive gray (5Y 4/1).

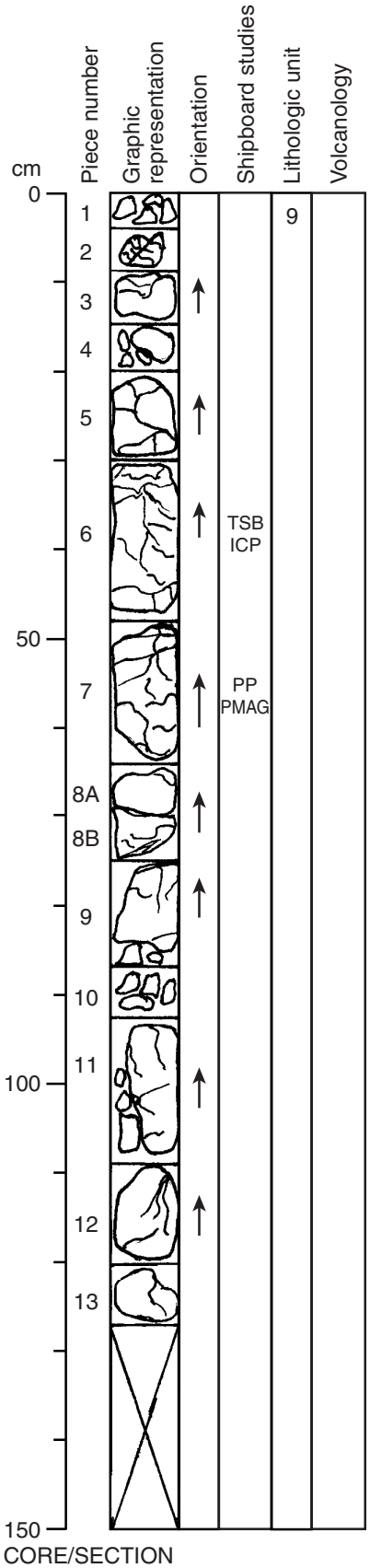
STRUCTURE: Pillowed. Brecciated pillow tops (Pieces 1 and 2) and altered glassy margins are present (Pieces 1, 2A, 3A, and 5).

ALTERATION: High to complete. Olivine phenocrysts are replaced by yellow-brown clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-5 mm wide and are filled with green clay and a white mineral (zeolite?).

COMMENTS: Sparse irregular miarolitic cavities (1–2 mm) in pillow interiors are filled with green clay.

Core Photo



192-1185B-14R-3 **Section Top: 408.70 mbsf**

UNIT 9: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–13

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–4	1.2	0.4	1	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained.

VESICLES: Nonvesicular.

COLOR: Moderate yellowish brown (10YR 5/4) to medium light gray (N6).

STRUCTURE: Pillow structure is inferred based on grain size variation, but no glassy margins are present.

ALTERATION: Moderate to high. Alteration is higher in aphanitic groundmass of pillow margins (e.g., Piece 5 and bottom of Piece 7).

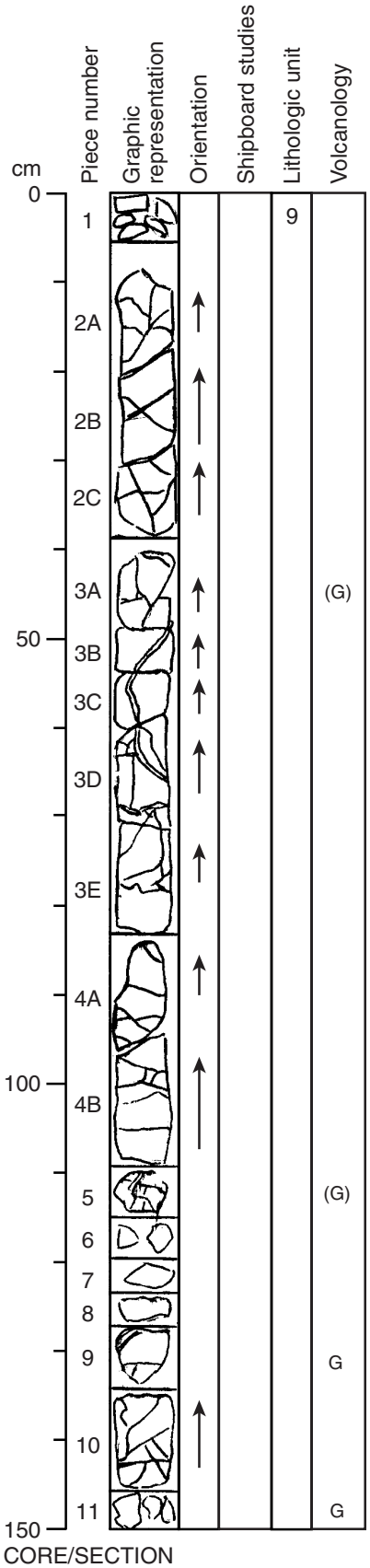
VEINS/FRACTURES: Moderately to highly veined. Pieces 2 and 6 contain the highest vein abundance. Veins are <1-5 mm wide and are filled with carbonate.

COMMENTS: Miarolitic cavities are present in Pieces 6 and 11. They are <1 mm in size and are filled with carbonate and green clay. Piece 9 has a band of abundant spherulites.

Description of thin section at 37-41 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-15R-1 **Section Top: 415.30 mbsf**

UNIT 9: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–11

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–2	2	<0.5	~1	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Glassy to aphanitic to fine grained. Aphanitic regions generally have spherulitic texture and fine-grained regions have variolitic texture.

VESICLES: Generally nonvesicular. Rare round vesicles (≤0.5 mm) are filled with green clay, Fe oxyhydroxide, and carbonate.

COLOR: Light gray (N7) to light brownish gray (5YR 6/1) to dark yellowish orange (10YR 6/6).

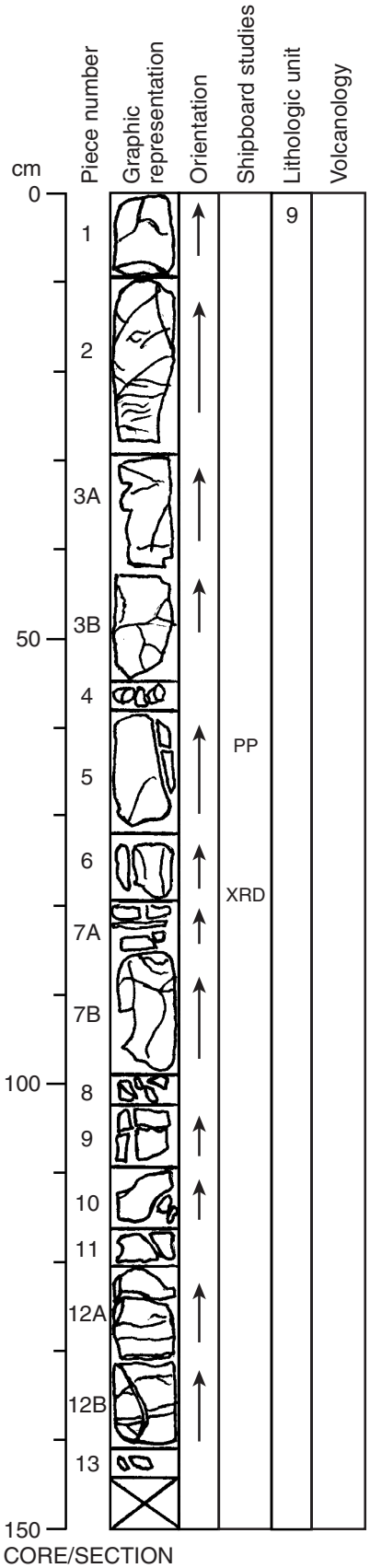
STRUCTURE: Pillowed. Pillow structure is inferred based on grain size variations and presence of convex glassy rims (e.g., Pieces 5–9 and 11).

ALTERATION: Highly altered, except for glassy rims, which are slightly to moderately altered. Alteration highlights spherulites in aphanitic zones. Olivine phenocrysts are completely replaced by Fe oxyhydroxide and clay.

VEINS/FRACTURES: Sparsely to highly veined. Pieces 2 and 3 have the most veins. Veins are <1-8 mm wide and are filled mainly with carbonate and, less commonly, with dark green clay and Fe oxyhydroxide.

COMMENTS: Irregular equant miarolitic cavities (~0.1 mm) are present; some are interconnected. They are filled with carbonate, green clay, and Fe oxyhydroxide.

Core Photo



192-1185B-15R-2 **Section Top: 416.80 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–13

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–2	0.6	<0.1	0.3	Euhedral to subhedral; rarely skeletal; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Generally nonvesicular. Rare round vesicles (<1 mm) are filled with carbonate and dark green clay (e.g., Piece 1).

COLOR: Pieces 1–4 are dark yellowish orange (10YR 6/6) to pale yellowish brown (10YR 6/2) to gray (10YR 5/1). Pieces 5–13 are medium gray (N5) to medium light gray (N6).

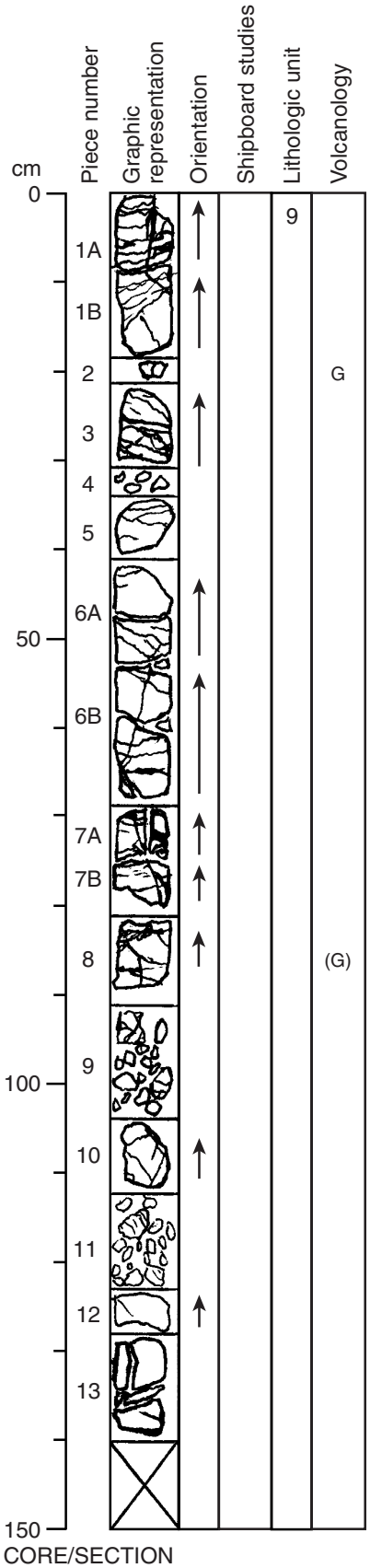
STRUCTURE: Pillowed. Grain size variation from aphanitic to fine grained indicates the top of a cooling unit in Piece 2. Pieces 5–13 are massive.

ALTERATION: High in Pieces 1–4; slight to moderate in Pieces 5–13. Olivine phenocrysts are replaced by Fe oxyhydroxide and green-black clay. Alteration highlights changes in groundmass grain size at the top of Piece 2.

VEINS/FRACTURES: Moderately to highly veined in Pieces 1–4; sparsely to moderately veined in Pieces 5–13. Veins are <1-2 mm wide and are filled with carbonate, green clay, and a white mineral (zeolite?).

COMMENTS: Irregular equant miarolitic cavities (<1-3 mm) are filled with carbonate and green clay (e.g., Piece 1).

Core Photo



192-1185B-15R-3 **Section Top: 418.21 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1A–13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1	1	<1	<1	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained. Pieces 2 and 8 have poorly developed spherulites near glassy rims. Fine-grained regions contain plagioclase, clinopyroxene, black oxides ± elongate olivine.

VESICLES: Nonvesicular.

COLOR: Mainly medium light gray (N6) to light gray (N7) to pale yellowish brown (10YR 6/2); locally grayish orange (10YR 7/4).

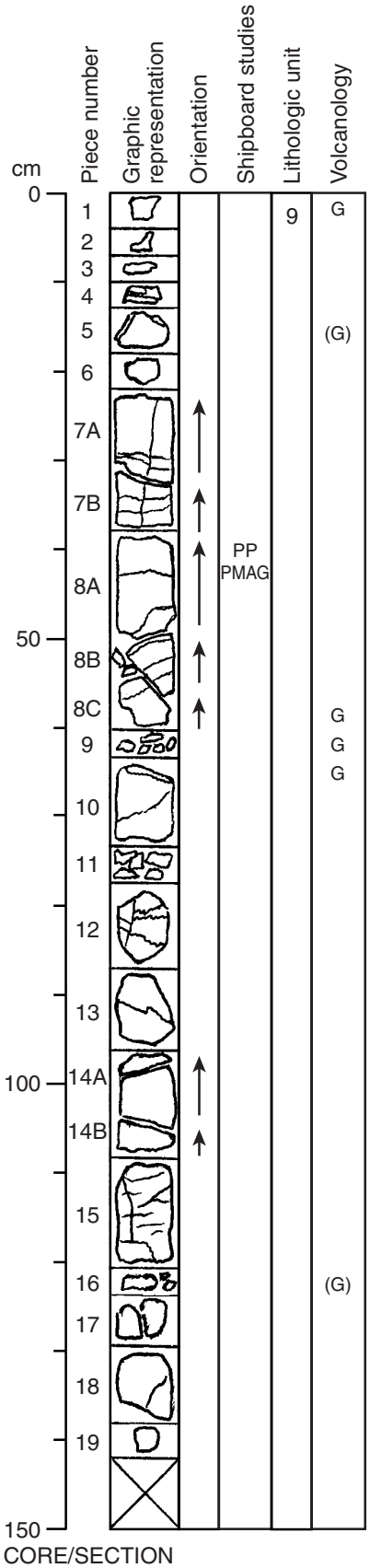
STRUCTURE: Pillowed. Unaltered glass is present in Piece 2 and highly altered glass is present in Piece 8.

ALTERATION: Slight to high. Fine-grained regions are the least altered. Olivine is replaced by Fe oxyhydroxide and green clay, or by black clay in the fine-grained regions (Pieces 12–13).

VEINS/FRACTURES: Highly veined (Pieces 1–11) to sparsely veined (Pieces 12–13). Veins are <1-5 mm wide and are filled with white carbonate (± zeolite), brown and dark green clay, and Fe oxyhydroxide.

COMMENTS: Sparse miarolitic cavities (<1-1.5 mm) are filled with green clay or white carbonate (Pieces 1A, 2, and 5).

Core Photo



192-1185B-16R-1 **Section Top: 424.90 mbsf**

UNIT 9 : SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–19

CONTACTS: None.

PHENOCRYSTS:

	% Grain Size (mm): Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–2	2	<0.5	~1	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Glassy to aphanitic to fine grained. Aphanitic regions have spherulitic texture and fine-grained regions have variolitic texture.

VESICLES: Generally nonvesicular. Rare round vesicles (~0.5 mm) are filled with green clay and Fe oxyhydroxide.

COLOR: Glass is dark gray (N3); basalt is medium light gray (N5) to grayish orange (10YR 7/4).

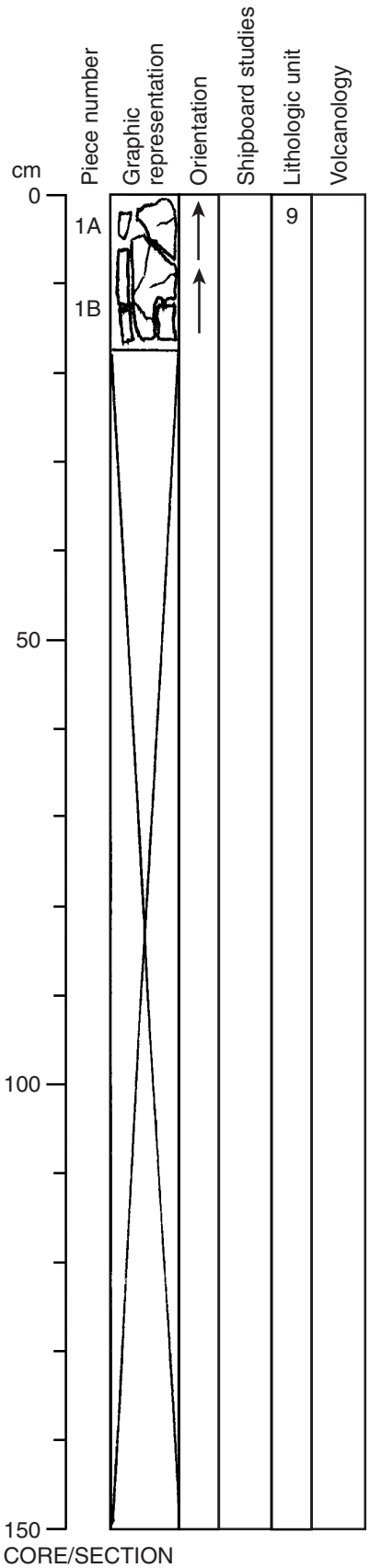
STRUCTURE: Pillowed. Pillow structure is inferred based on grain size variation and presence of convex glassy rims.

ALTERATION: Slightly to highly altered. The glassy rims in Pieces 8C, 10, 14A, and 14B are only slightly altered, but the crystalline portions are moderately altered. Pieces 1–6, 16 and 17 are highly altered. Olivine phenocrysts are replaced by Fe oxyhydroxide. Alteration highlights aphanitic regions.

VEINS/FRACTURES: Sparsely to highly veined (Piece 15). Veins are <1-3 mm wide and are filled with carbonate, green clay, and Fe oxyhydroxide.

COMMENTS: Irregular and equant miarolitic cavities (<0.5 mm) are present; some are interconnected. They are filled with carbonate, green clay, and Fe oxyhydroxide (e.g., Pieces 8A, 8B, 10, 12, 13, and 18).

Core Photo



192-1185B-16R-2 **Section Top: 426.32 mbsf**

UNIT 9: SPARSELY OLIVINE-PHYRIC BASALT

Piece: 1A-1B

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	~2			<1	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

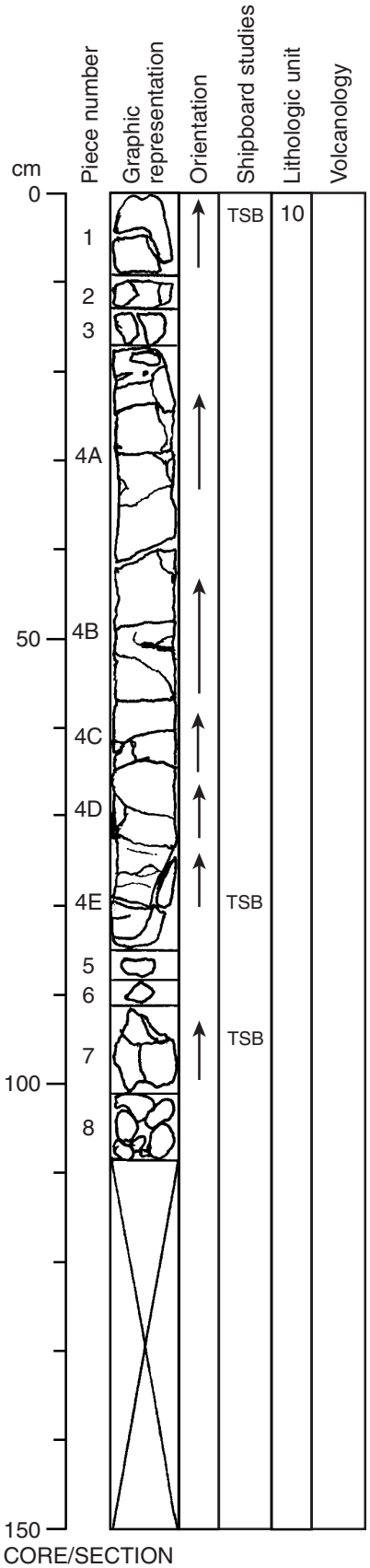
COLOR: Pale yellowish brown (10YR 6/2) to grayish orange (10YR 7/4).

STRUCTURE: Massive.

ALTERATION: High. Olivine phenocrysts are replaced by Fe oxyhydroxide.

VEINS/FRACTURES: Highly veined. Veins are <1-2 mm wide and are filled with carbonate.

Core Photo



192-1185B-17R-1 **Section Top: 434.60 mbsf**

UNIT 10: MODERATELY OLIVINE-PHYRIC BASALT AND BRECCIA

Pieces: 1–8

CONTACTS: Not recovered. The contact between Units 9 and 10 is inferred to be at the top of this section.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	4–7	1.2	0.3	0.5	Euhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic to fine grained. Aphanitic regions have spherulitic texture and fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Dark greenish black (5GY 2/1) to light gray (N7). The breccia (Pieces 1–4) is pale yellowish brown (10YR 6/6) to dark yellowish orange (10YR 6/6).

STRUCTURE: Massive. A brecciated zone (Pieces 1–4) at the top of the section probably represents a flow top.

ALTERATION: Slight to complete. Olivine phenocrysts are replaced by greenish black clay and Fe oxyhydroxide. Alteration highlights olivine phenocrysts. Brown and black halos are present.

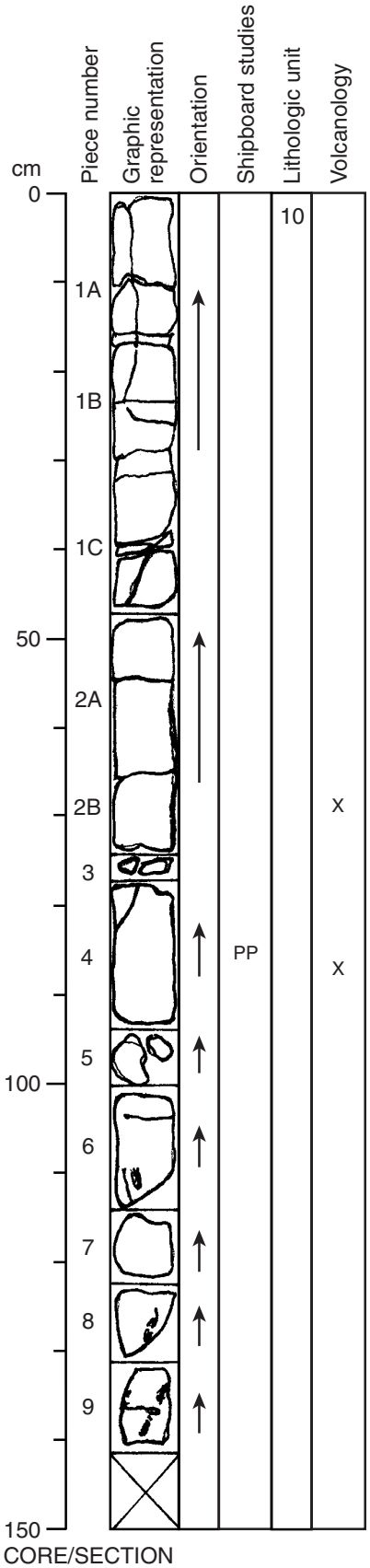
VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1-4 mm wide and are filled with carbonate. One vein filled with carbonate in Piece 4E is 10 mm wide, but only one margin is visible.

COMMENTS: Pieces 1–3 and the top of Piece 4 are breccia consisting of angular aphanitic basalt clasts in a matrix of carbonate, smectite, and less abundant Fe oxyhydroxide.

Description of thin section at 80-82 cm

Description of thin section at 94-98 cm

Core Photo



192-1185B-17R-2 **Section Top: 435.70 mbsf**

UNIT 10: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–9

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5–10	1.2	0.4	0.9	Euhedral to subhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture and contain plagioclase, clinopyroxene and black oxides.

VESICLES: Nonvesicular.

COLOR: Greenish gray (5G 6/1) to medium light gray (N6).

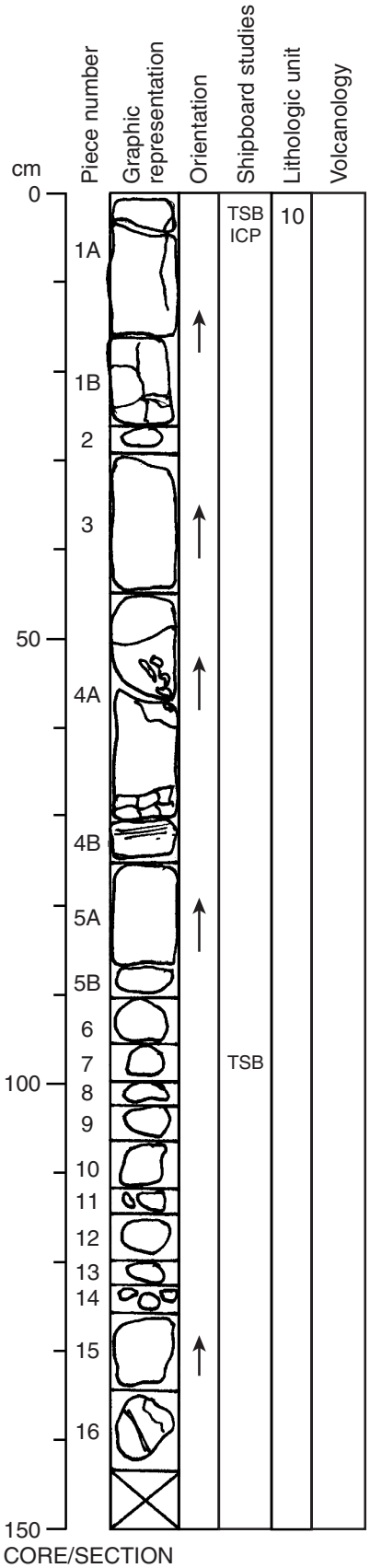
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Well developed olive and black halos are present near veins. Olivine phenocrysts are totally replaced by black-green clay.

VEINS/FRACTURES: Sparsely veined. Pieces 1A–1C have the highest abundance of veins. Veins are <1-3 mm wide and are filled first with Fe oxyhydroxide and then green clay.

COMMENTS: Miarolitic cavities, ~1 mm in diameter, are present in Pieces 1B, 6 and 7. Some cavities are interconnected and all are filled with green clay, Fe oxyhydroxide, and pyrite. Two xenoliths are present.
Xenolith 1 (Piece 2B) is 3 x 4 mm and composed of plagioclase crystals.
Xenolith 2 (Piece 4) is 2 x 5 mm and composed of plagioclase crystals.

Core Photo



192-1185B-17R-3 **Section Top: 437.11 mbsf**

UNIT 10: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–16

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	5–7	1	0.2	0.3	Euhedral to subhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions contain plagioclase and clinopyroxene, and have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight to moderate. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-4 mm wide and are filled with green and brown clay and carbonate.

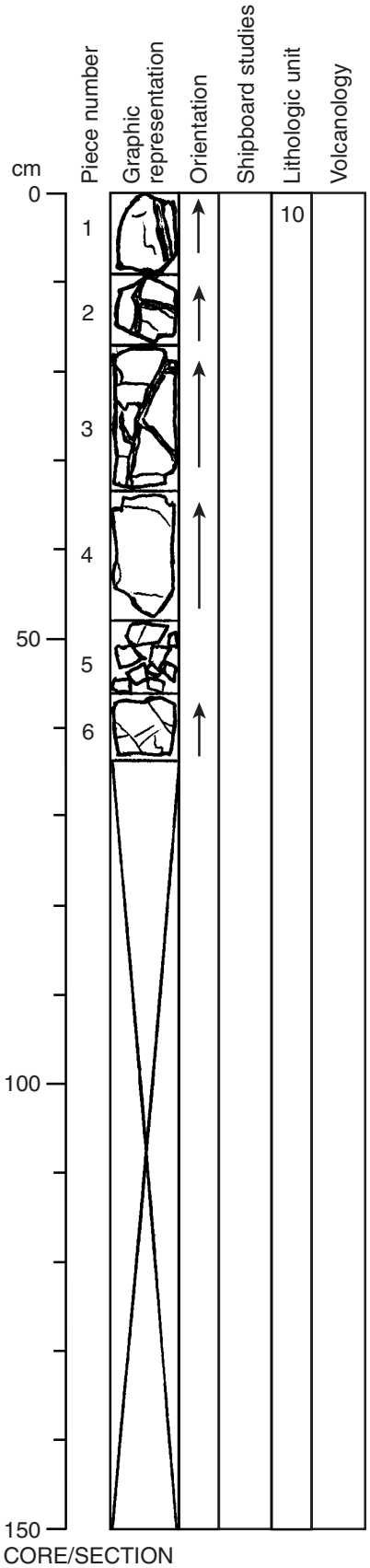
COMMENTS: Irregular miarolitic cavities (1–3 mm) are filled with green clay and carbonate (e.g., Piece 4A).

Description of thin section at 1-3 cm

Description of thin section at 96-98 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-17R-4 **Section Top: 438.54 mbsf**

UNIT 10: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–6

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2	0.8	0.5	0.5	Euhedral to subhedral

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

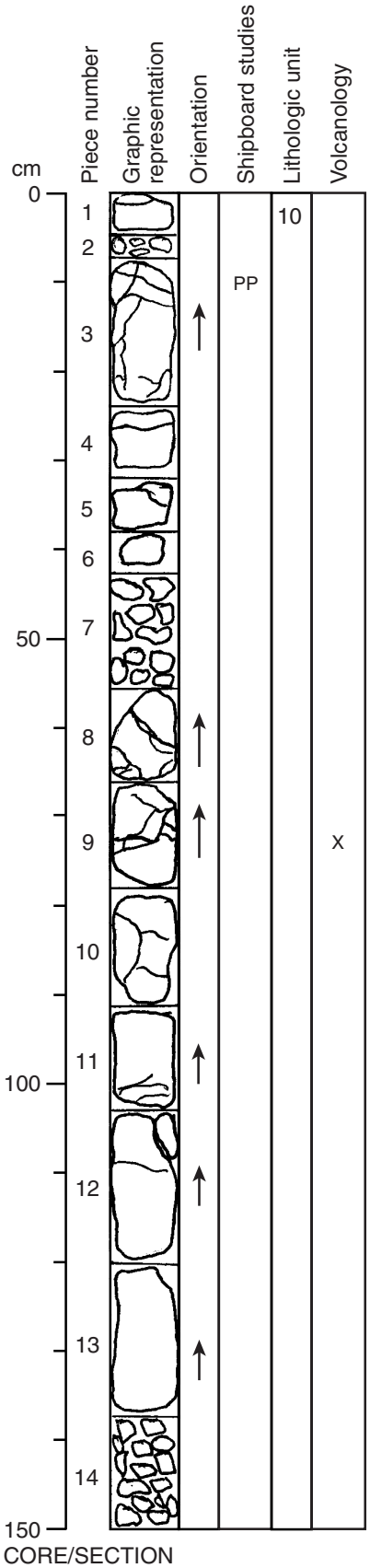
COLOR: Light gray (N7) to greenish gray (5G 6/1).

STRUCTURE: Massive.

ALTERATION: Moderate. Brown and olive halos are present. Olivine phenocrysts are replaced by green and black clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1-5 mm wide and are filled with green clay, carbonate, and native copper.

Core Photo



192-1185B-18R-1 **Section Top: 444.30 mbsf**

UNIT 10: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–14

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	8–10	2	0.5	1	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic (Pieces 1, 5, 6, 8) to fine grained (Pieces 3, 4, 7, 9–13). The fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light yellowish brown (10 YR 6/4; Piece 1). Light gray (N7) to medium light gray (N6) (Pieces 2–14).

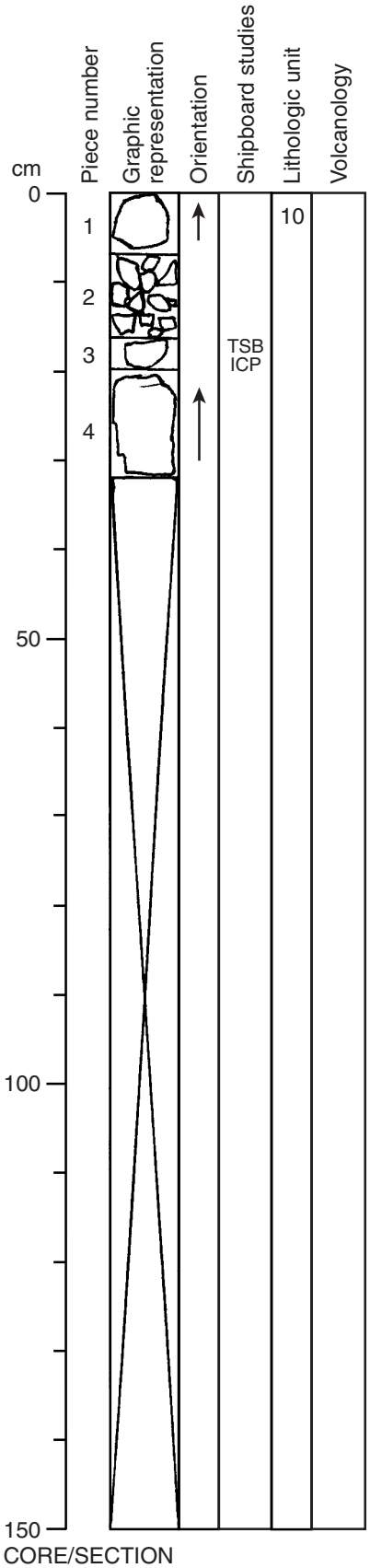
STRUCTURE: Pillowed. Pillow structure is inferred from grain size variations.

ALTERATION: Slight to moderate. The section is moderately altered around veins.

VEINS/FRACTURES: Sparsely to moderately veined. Veins (<1–3 mm) are concentrated in Pieces 3, 8, 9, and 10, and are filled with clay and Fe oxyhydroxide. Fragments in Piece 2 appear to be composed of vein material.

COMMENTS: Rare miarolitic cavities (0.5–1 mm) are filled with clay and carbonate. Piece 9 (70–71 cm) contains a plagioclase-rich xenolith (~5 x 6 mm).

Core Photo



192-1185B-18R-2 **Section Top: 445.80 mbsf**

UNIT 10: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–4

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	3	0.8	0.3	0.5	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Generally fine grained with variolitic texture. The grain size of Piece 1 is slightly lower than that of Pieces 2–4. Piece 1 has a variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium gray (N6).

STRUCTURE: Massive.

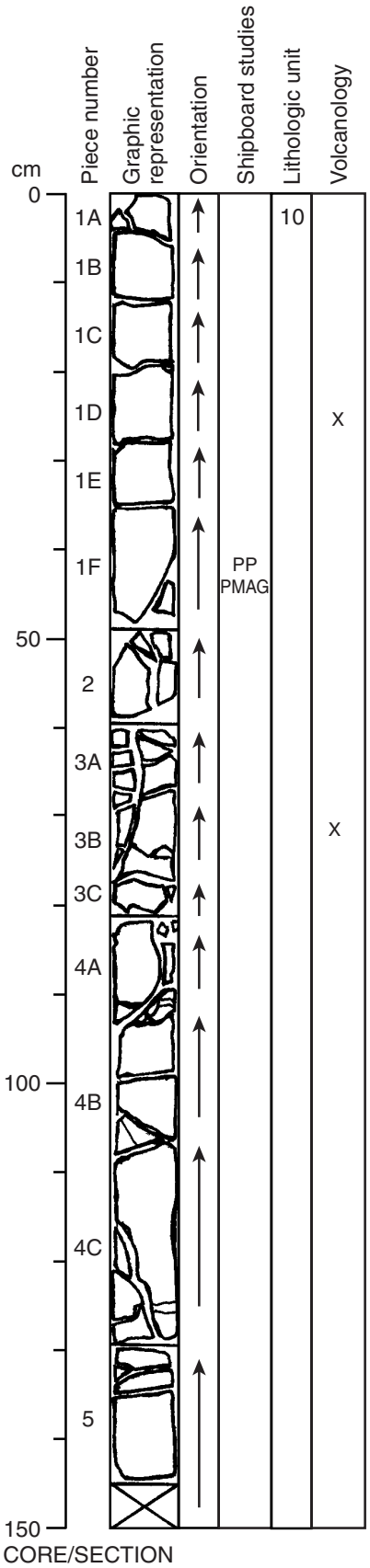
ALTERATION: Slight. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with green clay.

Description of thin section at 17-20 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-19R-1 **Section Top: 449.10 mbsf**

UNIT 10 : APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–5

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–3	1.5	0.5	1	Subhedral to euhedral

Olivine phenocrysts are abundant in variolitic areas.

GROUNDMASS: Fine grained. Pieces 3B–4B have the smallest grain size, and have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

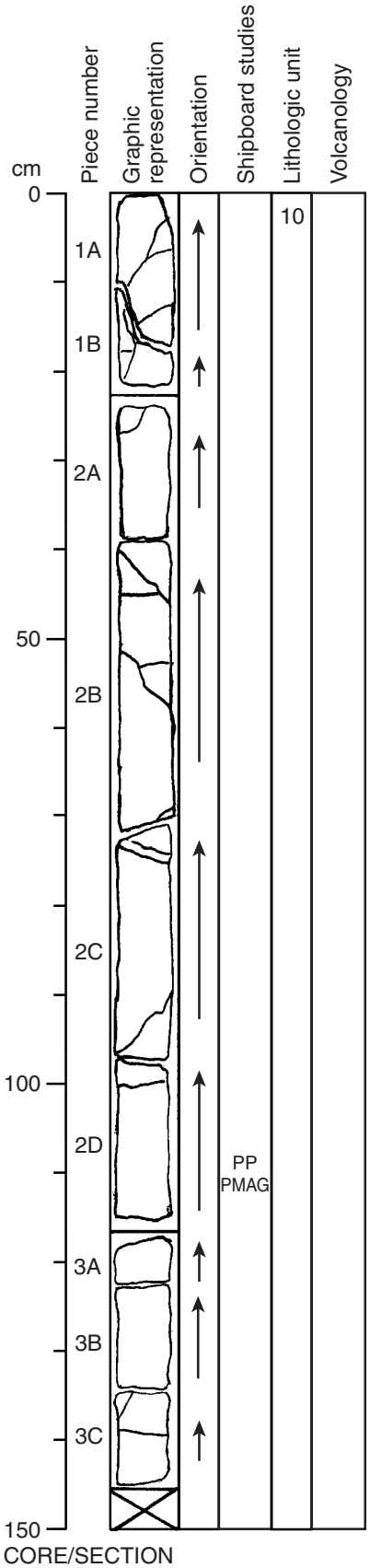
STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by black clay.

VEINS/FRACTURES: Sparsely to moderately veined. Pieces 3A–4C have the most veins. Veins are <1 mm wide and are filled with dark green clay, pyrite, carbonate, and Fe oxyhydroxide.

COMMENTS: Piece 3B contains a plagioclase-rich xenolith (5 x 3 mm) at 73 cm. Olivine phenocrysts are more abundant in the host basalt immediately adjacent to the xenolith.

Core Photo



192-1185B-19R-2 **Section Top: 450.55 mbsf**

UNIT 10 : APHYRIC BASALT

Pieces: 1A–3C

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture. The groundmass is composed of plagioclase, clinopyroxene, black oxides and equant euhedral to subhedral pseudomorphs after olivine.

VESICLES: Nonvesicular.

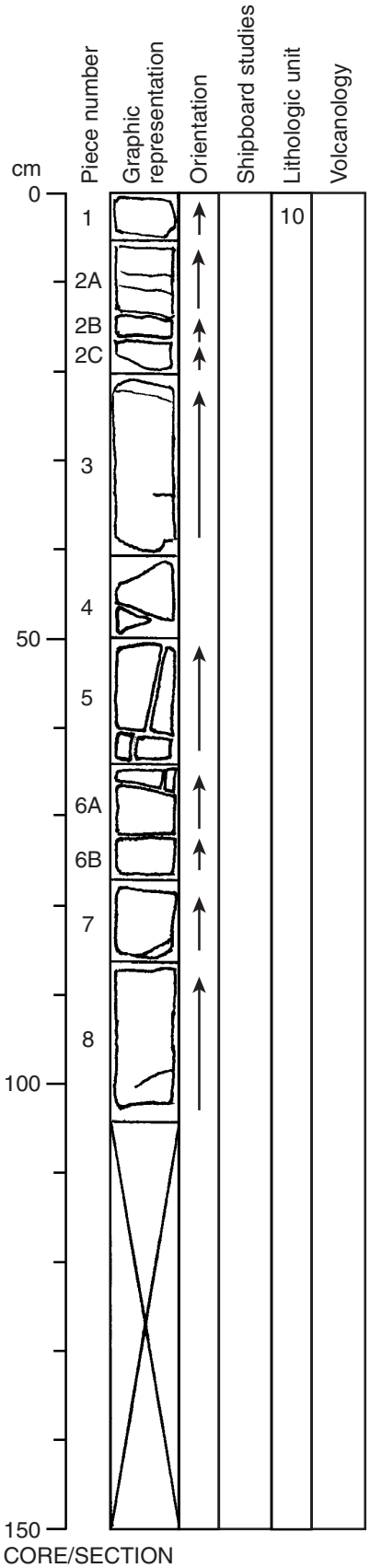
COLOR: Light gray (N7) to medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with black clay and sulfide.

Core Photo



192-1185B-19R-3 **Section Top: 452.00 mbsf**

UNIT 10 : APHYRIC BASALT

Pieces: 1–8

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture. The groundmass is composed of plagioclase, clinopyroxene, black oxides and equant euhedral to subhedral pseudomorphs after olivine.

VESICLES: Nonvesicular.

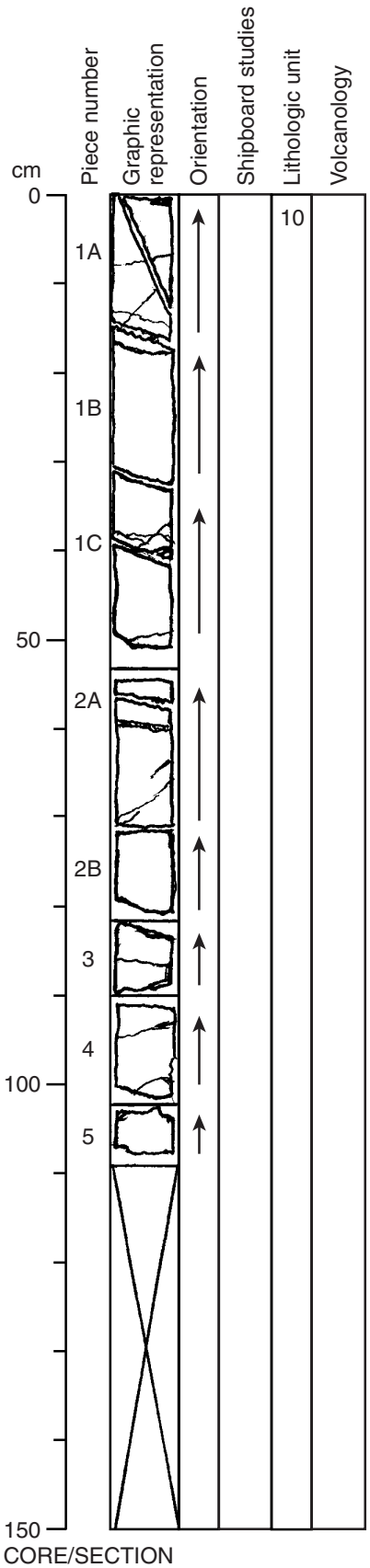
COLOR: Light gray (N7) to medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by black clay. Rare sulfide is present in the groundmass.

VEINS/FRACTURES: Sparsely veined. Veins are generally <1 mm wide and are filled with black clay and sulfide. A ≤2-mm vein in Piece 7 is filled with brown clay and Fe oxyhydroxide; it has a brown halo.

Core Photo



192-1185B-19R-4 **Section Top: 453.04 mbsf**

UNIT 10 : APHYRIC BASALT

Pieces: 1A–5

CONTACTS: None.

GROUNDMASS: Fine grained with variolitic texture. The groundmass is composed of plagioclase, clinopyroxene, black oxides and equant, euhedral to subhedral pseudomorphs after olivine. Olivine crystals are sometimes present in clusters.

VESICLES: Nonvesicular.

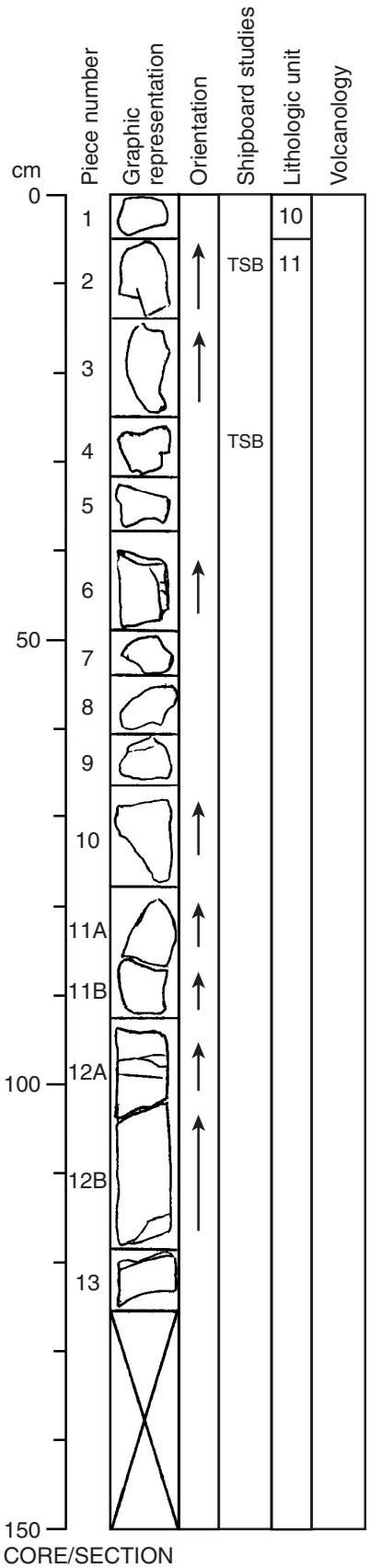
COLOR: Light gray (N7) to medium dark gray (N4).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by black clay and rarely by sulfide.

VEINS/FRACTURES: Sparsely veined. Veins are <1-3 mm wide and are filled with crystalline calcite, brown and green smectite, zeolites, sulfide, and Fe oxyhydroxide. The 3-mm vein in Piece 2A shows evidence for multiple phases of filling.

Core Photo



192-1185B-20R-1 **Section Top: 453.90 mbsf**

UNIT 10: APHYRIC BASALT

Piece: 1

CONTACTS: Not recovered. The contact between Units 10 and 11 is inferred to be between Pieces 1 and 2, and is based on a change in degree of alteration, the highly vesicular nature of Piece 4, and an abrupt increase in drilling rate at the top of Core 20.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	<1	1	0.5	0.7	Subhedral to euhedral

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

STRUCTURE: Massive (one small piece only).

ALTERATION: Slight. Olivine is replaced by green clay and sulfide.

VEINS/FRACTURES: None.

COMMENTS: Unaltered subhedral plagioclase laths (~1 mm) are present, and may be xenocrystic.

UNIT 11: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 2–13

CONTACTS: Not recovered. The contact between Units 10 and 11 is inferred to be between Pieces 1 and 2, and is based on a change in degree of alteration, the highly vesicular nature of Piece 4, and an abrupt increase in drilling rate at the top of Core 20.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	1–3	2	<0.5	1	Subhedral to euhedral

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Generally nonvesicular, except Piece 4 which is highly vesicular. Vesicles (<0.5 to 4 mm) are angular and subelongate, and are partially filled with green clay and carbonate.

COLOR: Greenish gray (5G 6/1) and greenish orange (10YR 7/4) in Pieces 2–9; light gray (N7) in Pieces 10–13.

STRUCTURE: Massive.

ALTERATION: Slightly altered at the bottom to highly altered at the top (Pieces 2–9). Curved alteration halos are present in Pieces 4–6. Olivine phenocrysts are replaced mainly by carbonate at the top of the section and by green clay and sulfide at the bottom.

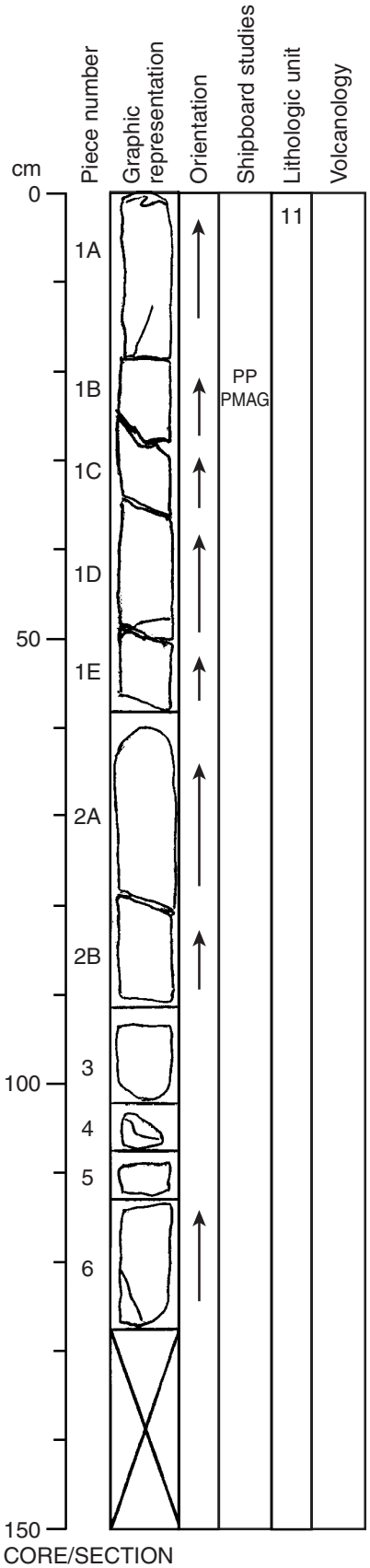
VEINS/FRACTURES: Sparsely veined. Veins are <1-5 mm wide and are filled with carbonate, green clay, and sulfide.

COMMENTS: Miarolitic cavities are locally moderately abundant (Pieces 12A and 12B). They are angular, <0.1 to 2 mm in size, and are filled with carbonate, green clay, and sulfide.
A 4 x 2-mm plagioclase-rich xenolith is present in Piece 10.

Description of thin section at 6-9 cm

Description of thin section at 27-29 cm

Core Photo



192-1185B-20R-2 **Section Top: 455.15 mbsf**

UNIT 11: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–4	1	0.1	0.5	Euhedral to subhedral; commonly in glomerocrysts

Average phenocryst abundance increases toward the bottom of the section.

GROUNDMASS: Fine grained to aphanitic.

VESICLES: Nonvesicular.

COLOR: Medium gray (N5) to very light gray (N8).

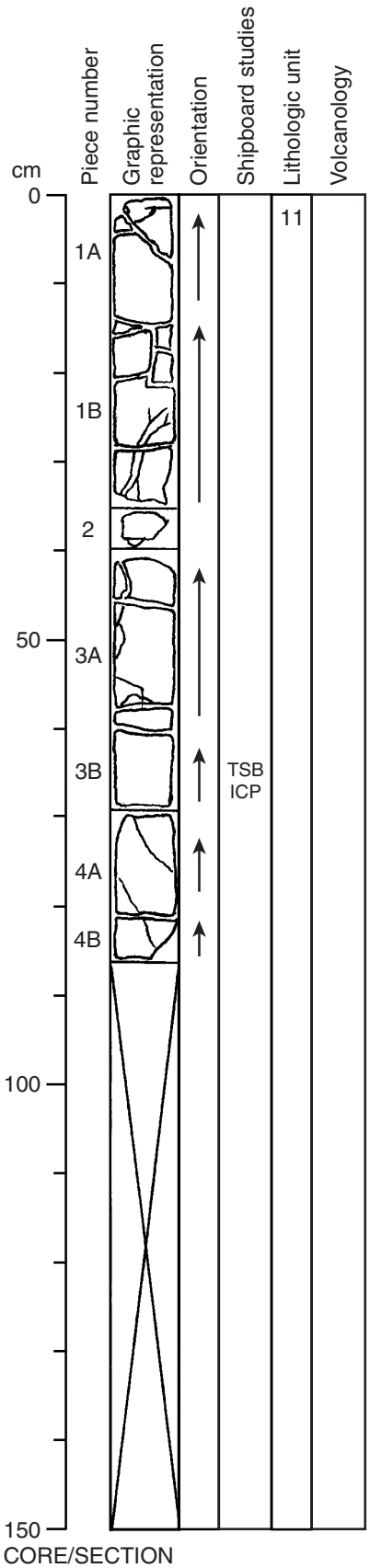
STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by green-black clay.

VEINS/FRACTURES: Sparsely veined. Veins are ≤1 mm wide and are filled with carbonate, brown and dark green clay, sulfide, and zeolite.

COMMENTS: Sparse miarolitic cavities are filled with dark green clay.
Plagioclase-rich xenoliths are present in Piece 1A (2 x 3 mm) and Piece 1C (3 x 3 mm). Olivine phenocrysts are more abundant in the host basalt immediately adjacent to the xenoliths.

Core Photo



192-1185B-20R-3 **Section Top: 456.43 mbsf**

UNIT 11: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1A–4B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–2	1.5	0.5	1	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

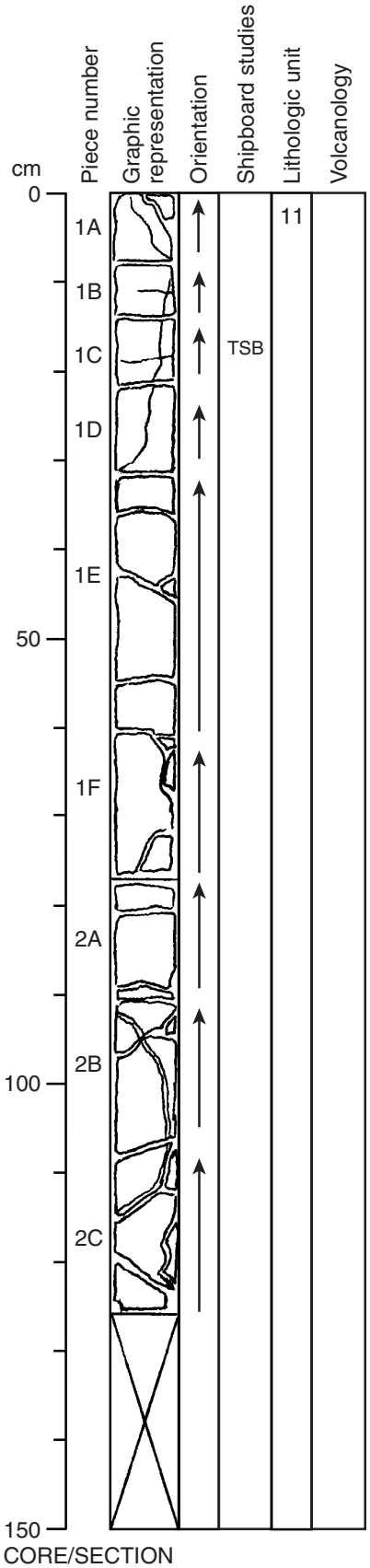
ALTERATION: Slight to moderate near veins. Olivine is replaced by green clay. Sulfide is occasionally present in the groundmass.

VEINS/FRACTURES: Sparsely veined. Veins are <1-2 mm wide and are filled with green clay, sulfide, and Fe oxyhydroxide. A plagioclase-rich xenolith (2 x 3 mm) is present in Piece 4.

Description of thin section at 66-68 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-20R-4 **Section Top: 457.29 mbsf**

UNIT 11: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2C

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–2	0.6	<0.1	0.3	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

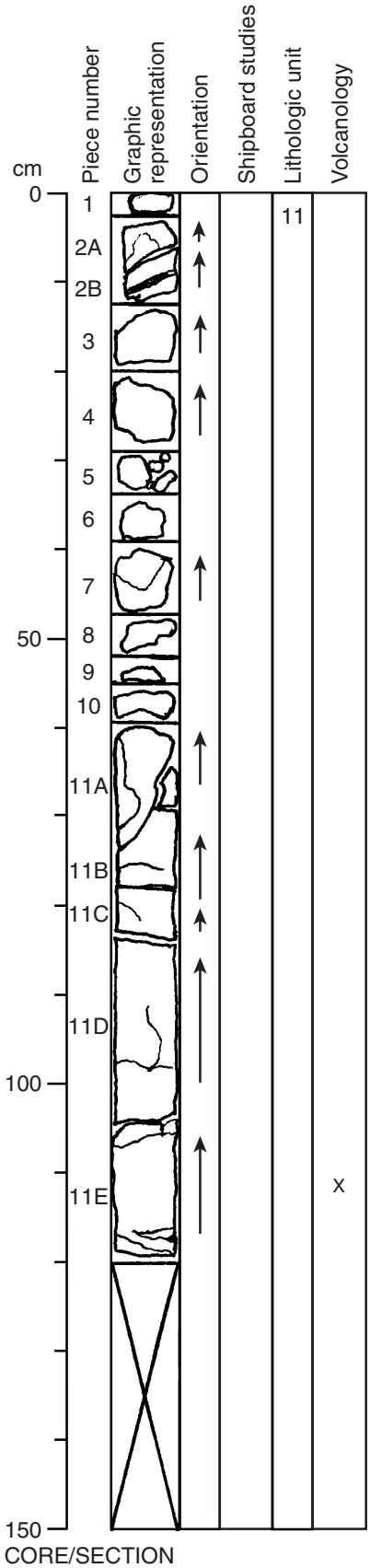
COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by green-black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-3 mm wide and are filled with white carbonate, green and black clay, and sulfide.

Core Photo



192-1185B-21R-1 **Section Top: 463.60 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–11E

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–4	1	0.2	0.5	Euhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Generally nonvesicular. Piece 5 is sparsely to moderately vesicular. Vesicles are filled with carbonate and green clay.

COLOR: Medium light gray (N6), greenish gray (5G 6/1) and light olive gray (5Y 6/1).

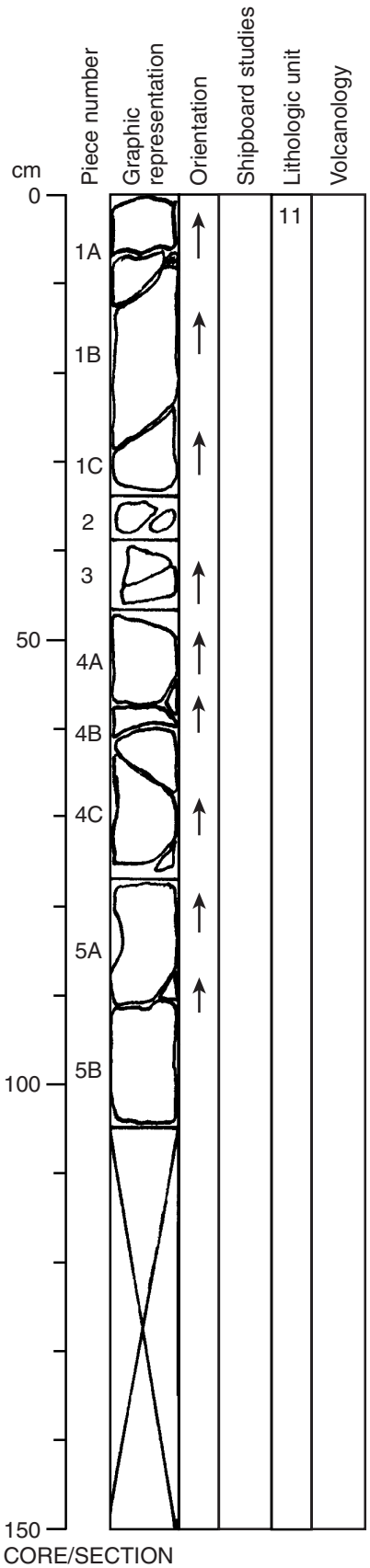
STRUCTURE: Massive.

ALTERATION: Moderate in Pieces 1, 2, 4–10 and slight in Pieces 2 and 11A–E. Green and brown halos are present. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. The largest vein is 1-2 mm wide and is filled with carbonate.

COMMENTS: Carbonate-filled miarolitic cavities (irregularly shaped and <3 mm in length) are present in Piece 3. Piece 11E contains a plagioclase-rich xenolith (4 x 2.5 mm) at 110–111 cm.

Core Photo



192-1185B-21R-2 **Section Top: 464.79 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–5B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	7–9	1	0.2	0.3	Euhedral

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

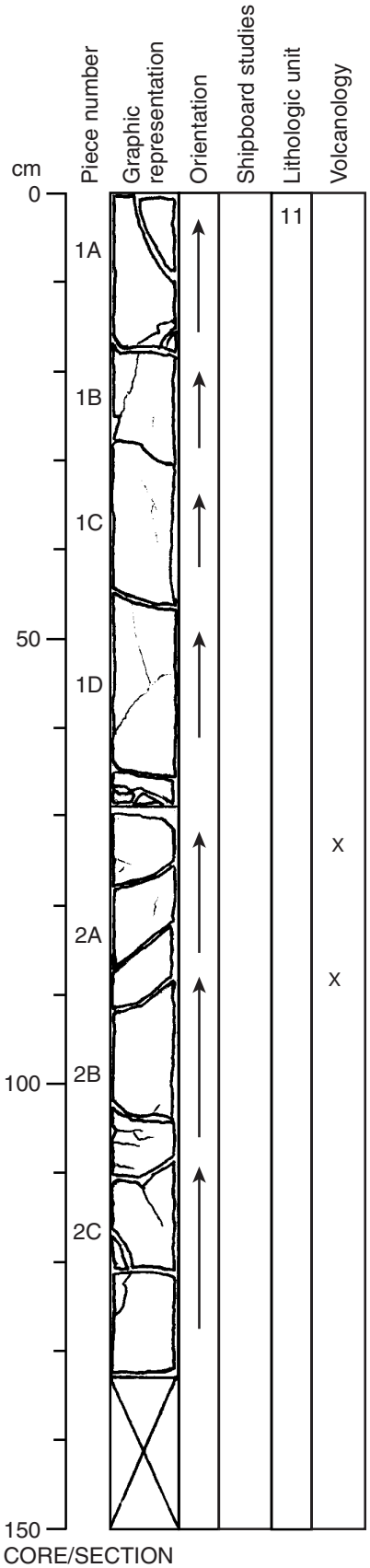
STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-2 mm wide and are filled with carbonate and green clay.

COMMENTS: Rare miarolitic cavities (~1 mm in diameter) are filled with carbonate and green clay.

Core Photo



192-1185B-21R-3 **Section Top: 465.85 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	3	1.0	0.3	0.5	Euhedral

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

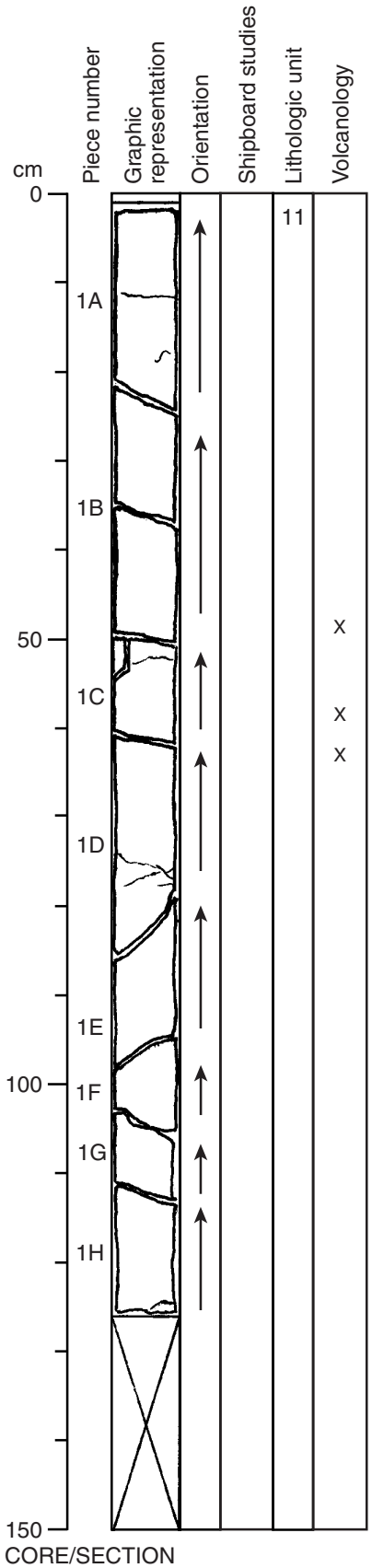
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with carbonate and black clay.

COMMENTS: A plagioclase-rich xenolith (3.5 x 2 mm) is present in Piece 2A (outer surface).

Core Photo



192-1185B-21R-4 **Section Top: 467.17 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1H

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–3	0.8	0.3	0.5	Euhedral to subhedral

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

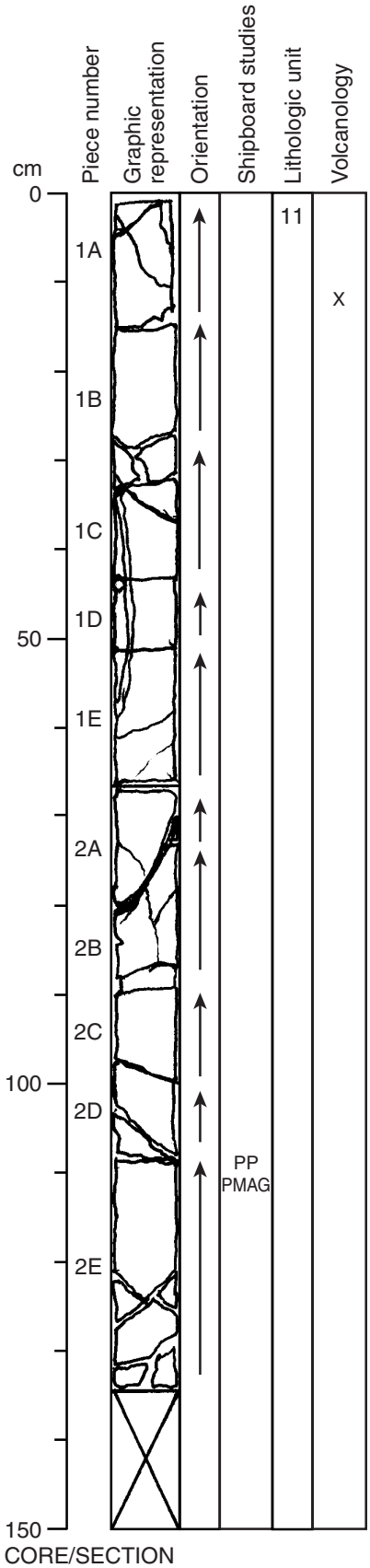
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with carbonate and green clay.

COMMENTS: Three xenoliths are present on the outer surface.
Xenolith 1 (Piece 1B): plagioclase rich; 3 x 2.5 mm.
Xenolith 2 (Piece 1C): plagioclase-rich; 3 x 2 mm.
Xenolith 3 (Piece 1D): plagioclase-rich; 2 x 1 mm.

Core Photo



192-1185B-21R-5 **Section Top: 468.43 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2E

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–5	1.1	0.2	0.5	Euhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

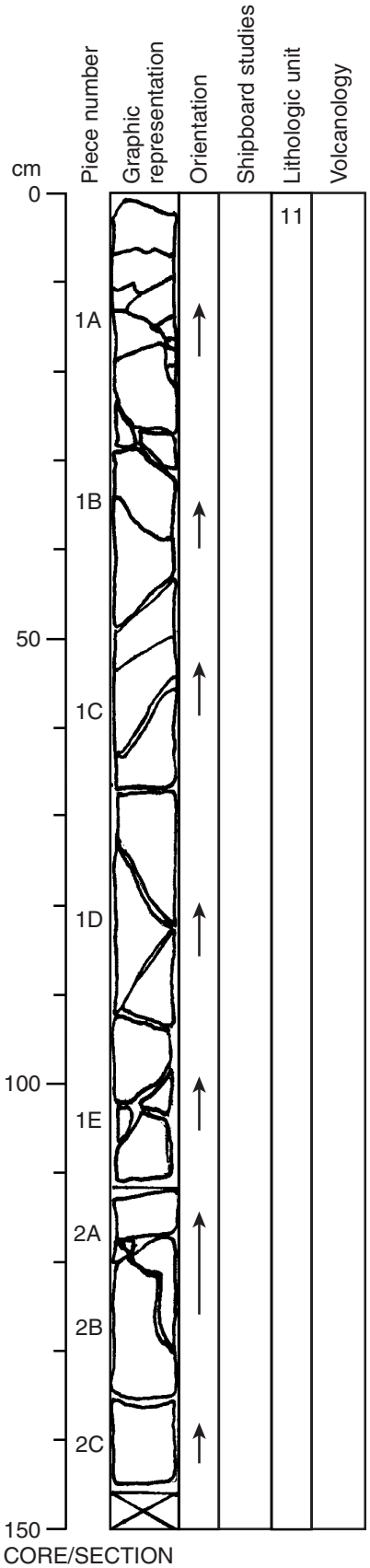
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Olivine phenocrysts are replaced by green-black clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1-8 mm wide and are filled with carbonate.

COMMENTS: A plagioclase-rich xenolith (2 x 2 mm) is present on the outer surface of Piece 1A at 12–13 cm.

Core Photo



192-1185B-21R-6 **Section Top: 469.77 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2C

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	6–8	1	<0.4	0.4	Euhedral to subhedral

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

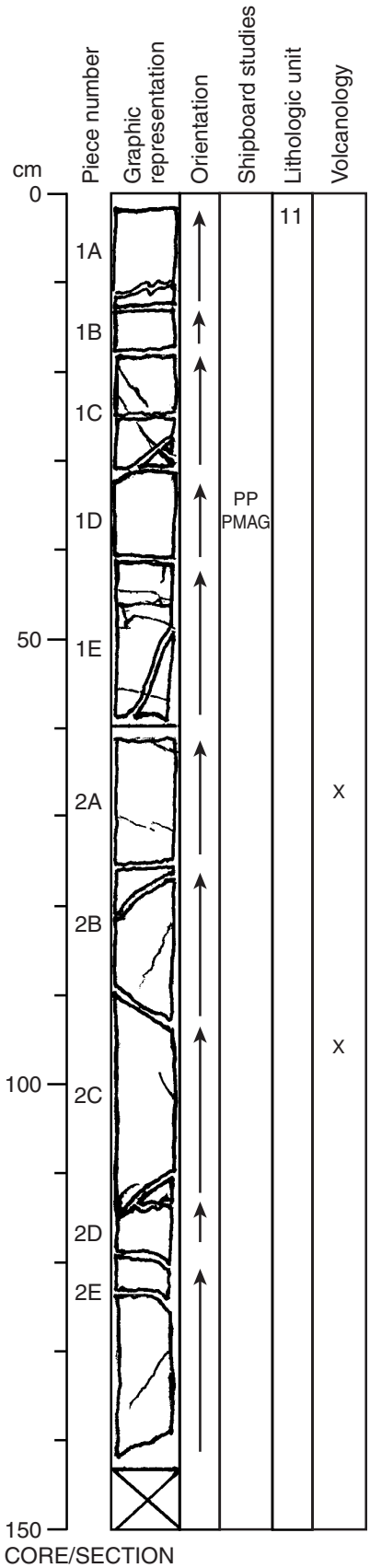
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are partially replaced by green clay and carbonate.

VEINS/FRACTURES: Sparsely to moderately veined. One vein in Piece 2B is 3 mm wide and is filled with carbonate. Other veins are <1 mm wide and are filled with green clay.

COMMENTS: Sparse miarolitic cavities are filled with green clay.

Core Photo



192-1185B-21R-7 **Section Top: 471.22 mbsf**

UNIT 11: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–2E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–3	1.2	~0.5	0.9	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

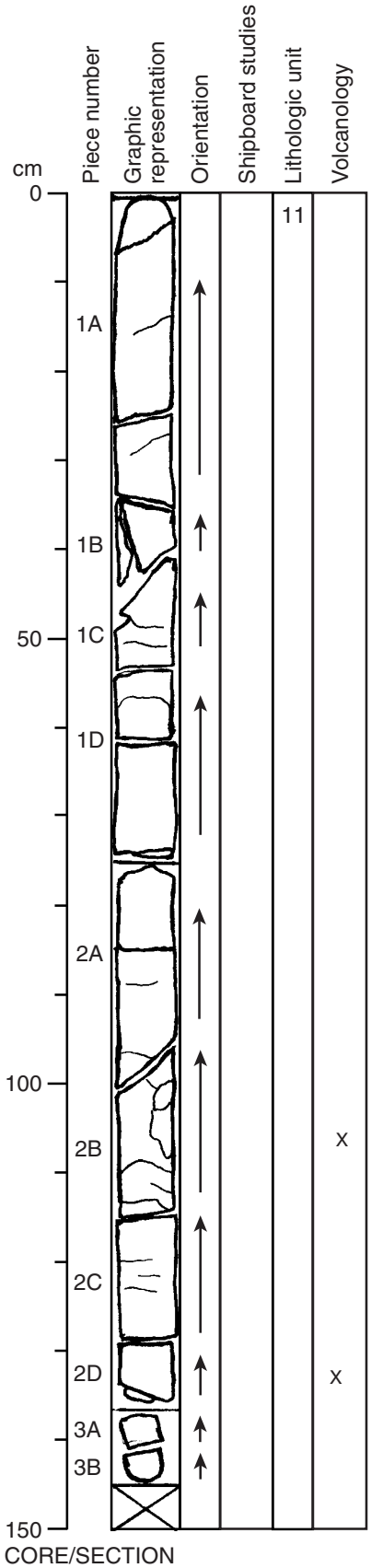
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-2 mm wide and are filled with green clay, carbonate, and Fe oxyhydroxide.

COMMENTS: Sparse miarolitic cavities are filled with green clay. Plagioclase xenocrysts are present at 63 cm (Piece 2A) and 93 cm (Piece 2C).

Core Photo



192-1185B-21R-8 **Section Top: 472.64 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–3B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	2–6	1.2	0.3	0.5	Euhedral to subhedral; commonly in glomerocrysts

GROUNDMASS: Fine grained with variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

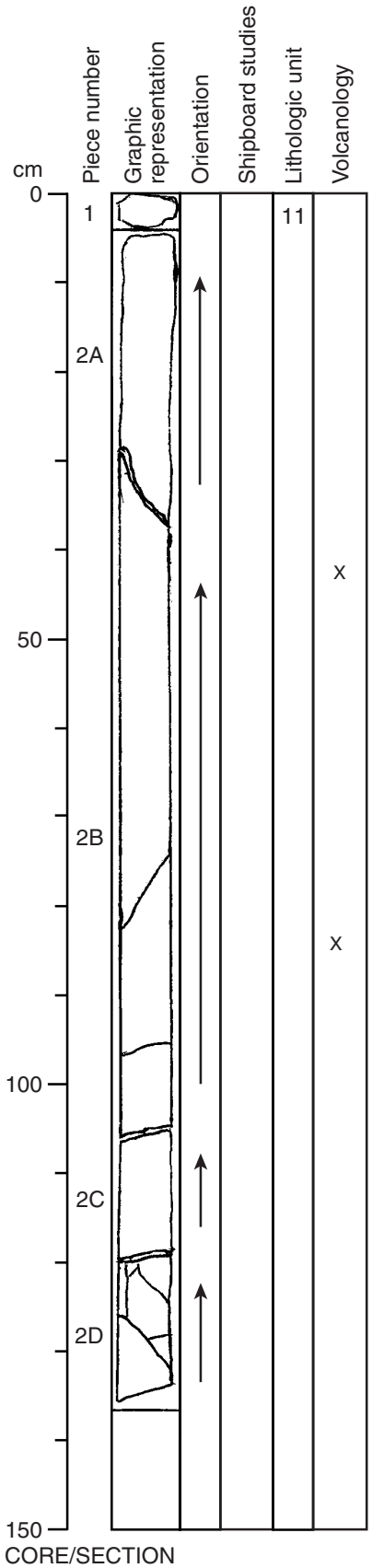
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by black clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are ≤1 mm wide and are filled with green and black clay with minor zeolite.

COMMENTS: Irregular miarolitic cavities (1–2 mm) are filled with black and green clay. Plagioclase-rich xenoliths (4 x 3 mm and 2 x 2 mm) are present at 107 cm (Piece 2B) and 131 cm (Piece 2D; outer surface).

Core Photo



192-1185B-22R-1 **Section Top: 473.20 mbsf**

UNIT 11: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–2D

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine: in	<1-4	0.6	<0.1	0.3	Subhedral; commonly glomerocrysts.

The abundance of small subhedral olivine crystals is highest in Piece 1 and generally decreases downsection.

GROUNDMASS: Predominantly fine grained with variolitic texture. Irregular aphanitic bands with diffuse margins cut across the section (e.g., Piece 2B).

VESICLES: Nonvesicular.

COLOR: Medium gray (N5) to medium light gray (N6).

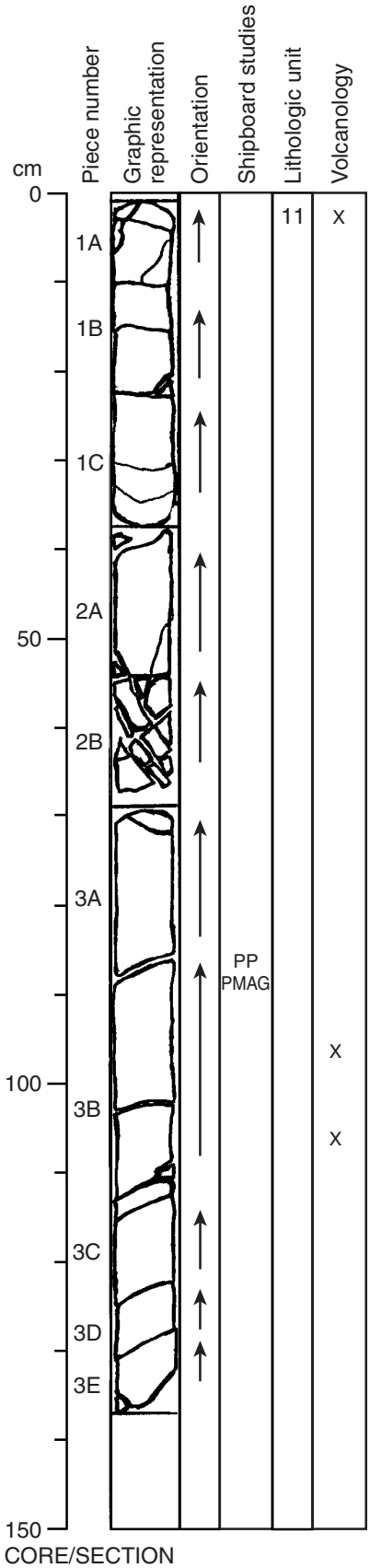
STRUCTURE: Massive.

ALTERATION: Slight. Olivine crystals are replaced by black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with black and green clay.

COMMENTS: A plagioclase-rich xenolith (~4 mm) is present in Piece 2B at 41 cm. Several small (~1 mm) plagioclase-rich xenoliths are also present (e.g., in Piece 2B at ~88 cm). Rare miarolitic cavities (~2 mm) are filled with green clay (e.g., Piece 1).

Core Photo



192-1185B-22R-2 **Section Top: 474.56 mbsf**

UNIT 11: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–3E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–4	1.1	0.5	0.8	Subhedral to euhedral

Olivine phenocrysts are most abundant in the finer-grained regions.

GROUNDMASS: Fine grained. A subvertical finer-grained funnel-shaped band is present in Pieces 1A and 1B.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

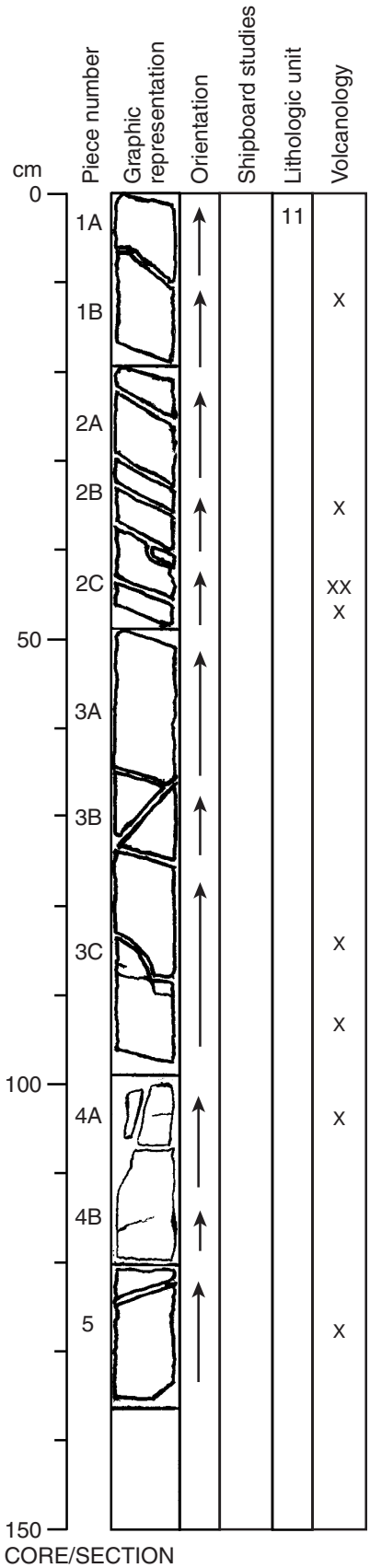
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are replaced by dark green clay.

VEINS/FRACTURES: Sparsely to moderately veined. Piece 2B has the highest abundance of veins. Veins are <1 mm wide and are filled with dark green clay.

COMMENTS: Plagioclase-rich xenoliths (1–3 mm) are present at 40.5, 49, 96 and 107 cm.

Core Photo



192-1185B-22R-3 **Section Top: 475.96 mbsf**

UNIT 11: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–5

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–4	0.8	0.1	0.2	Euhedral to subhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to light gray (N7); locally medium gray (N5).

STRUCTURE: Massive.

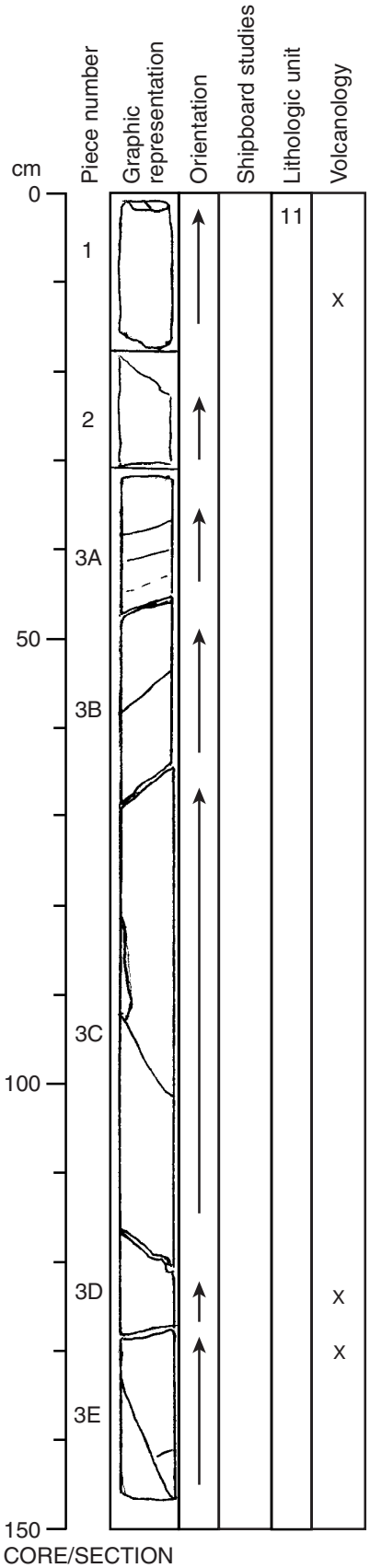
ALTERATION: Slight. Olivine phenocrysts are replaced by black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1-2 mm wide and are filled with green clay, sulfide, and brown clay.

COMMENTS: Plagioclase-rich xenoliths are present throughout the section (on split face unless otherwise stated):

Interval (cm)	Size (mm)	
11.5	2 x 3	
35	3 x 4	
40	5 x 3	
40	4 x 3	
43	4 x 4	(outer surface)
85	5 x 3	
95	2 x 2	
105	3 x 3	(outer surface)
127	2 x 2	

Core Photo



192-1185B-22R-4 **Section Top: 477.33 mbsf**

UNIT 11: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–3E

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	0–2	1.8	0.5	~1	Subhedral to euhedral

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

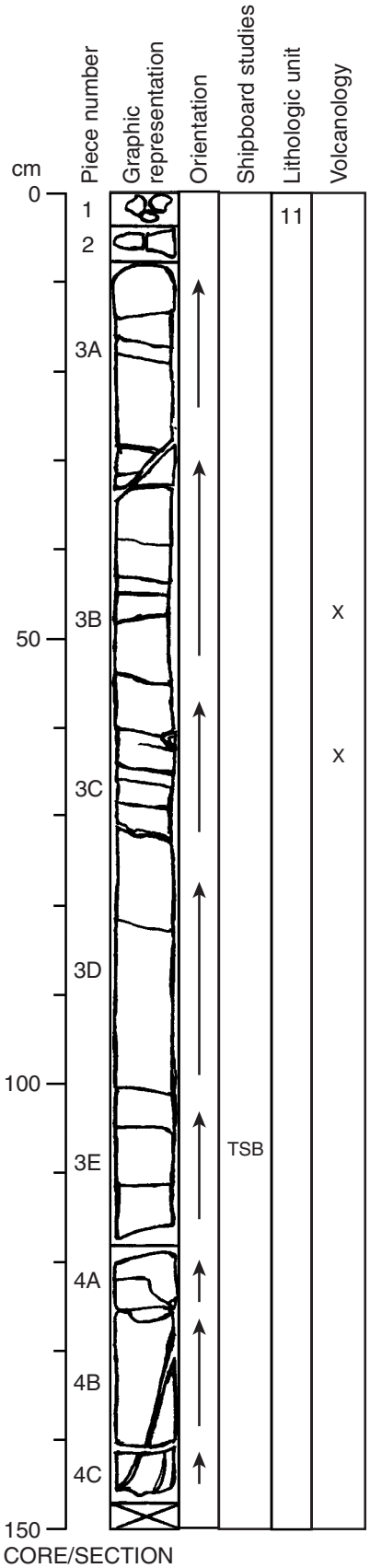
STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with dark green clay.

COMMENTS: Two subround plagioclase-rich xenoliths (4 x 3 mm and 6 x 7 mm) are present in Piece 1 at 10–11 cm; one subround plagioclase-rich xenolith (4 x 4 mm) is present in Piece 3E at 130 cm. Several smaller plagioclase-rich xenoliths (1–2 mm) are present throughout the section.

Core Photo



192-1185B-22R-5 **Section Top: 478.83 mbsf**

UNIT 11: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–4C

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	<1–2	1.2	0.5	~0.7	Subhedral to euhedral

Olivine phenocrysts are unevenly distributed; they are most abundant in the finer-grained regions.

GROUNDMASS: Fine grained. Subhorizontal banding is defined by regions of slightly coarser and finer grain size; the contacts between these regions are diffuse.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium light gray (N6).

STRUCTURE: Massive.

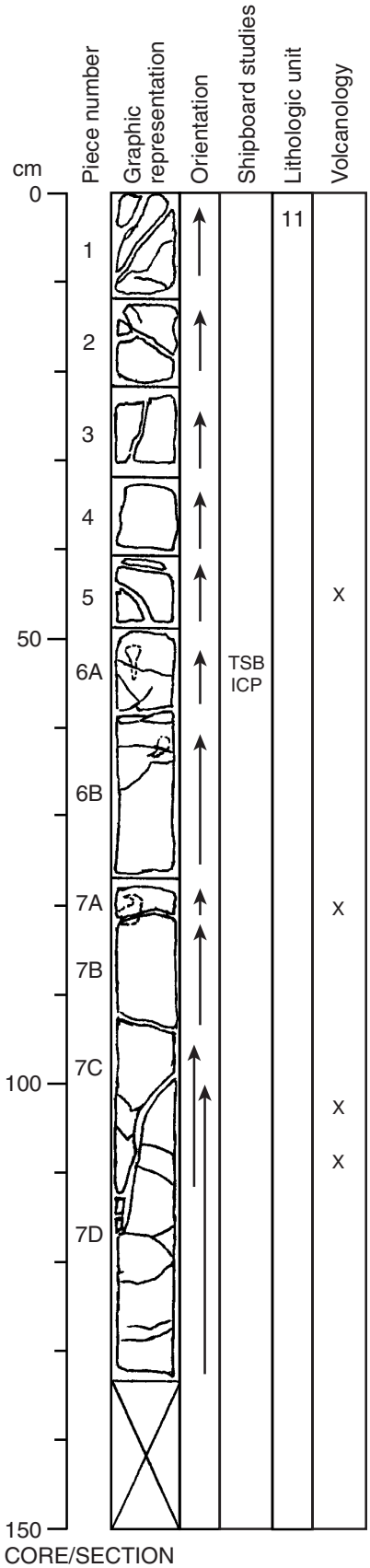
ALTERATION: Slight. Olivine is replaced by dark green clay.

VEINS/FRACTURES: Moderately veined. Veins are <1 mm wide and are filled with dark green clay and carbonate.

COMMENTS: Contains stubby plagioclase xenocrysts (<1.5 mm) and xenoliths (<4 mm) consisting of plagioclase and dark green clay.

Description of thin section at 107-110 cm

Core Photo



192-1185B-22R-6 **Section Top: 480.30 mbsf**

UNIT 11: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–7D

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–2	0.5	<0.1	0.1	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to light gray (N7).

STRUCTURE: Massive.

ALTERATION: Unaltered to slightly altered. Olivine phenocrysts are replaced by black clay.

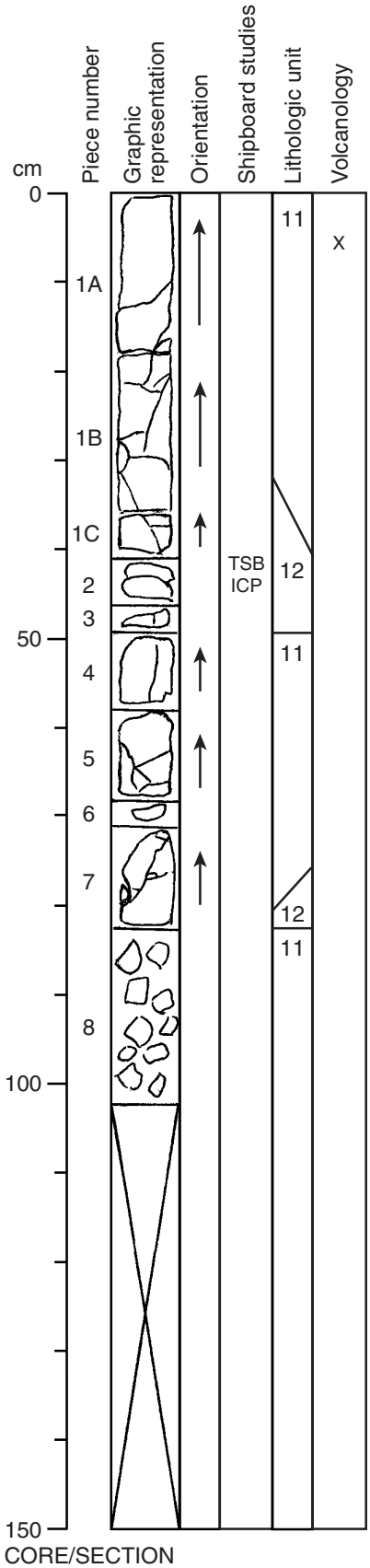
VEINS/FRACTURES: Moderately veined. Veins are <1 mm wide and are filled with white carbonate and black and green clay.

COMMENTS: Distinct subhorizontal bands are present in Pieces 3, 4 and 6B. They have diffuse margins, are paler than the surrounding basalt, and have a lower abundance of ferromagnesian minerals. Pieces 6A, 6B, 7A and 7B contain irregular dark-colored patches (1–5 cm); the darker regions are coarser grained and have a greater abundance of ferromagnesian minerals than the surrounding material. Several plagioclase xenocrysts (~1 mm) are present, in addition to plagioclase-rich xenoliths (1.5 to 2.5 mm) at 43.5, 82, 103 and 109 cm.

Description of thin section at 51-54 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-22R-7 **Section Top: 481.64 mbsf**

UNIT 11: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1A–1C, 4–8

CONTACTS: The irregular contact between Units 11 and 12 is recovered in Pieces 1A–1C and in Piece 7. Unit 11 has a chilled margin adjacent to the contact; Unit 12 has no chilled margins.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–3	0.5	0.1	0.2	Subhedral to euhedral; commonly in glomerocrysts

GROUNDMASS: Aphanitic.

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium gray (N5) in the chilled margin.

STRUCTURE: Chilled against fine-grained basalt of Unit 12. Pieces 5–7 contain white carbonate sediment with red (10R 4/6) carbonate and fresh glass clasts. In Piece 7, the carbonate sediment is located at the contact between Units 11 and 12.

ALTERATION: Slight to moderate near the margin. Olivine is replaced by dark green clay, Fe oxyhydroxide, and rare sulfide.

VEINS/FRACTURES: Moderately veined. Veins are <1 mm wide and are filled with dark green clay and Fe oxyhydroxide.

COMMENTS: Stubby plagioclase xenocrysts (<1–2 mm) are present. A coarser-grained patch (10 x 5 mm) of aphyric basalt is present in Piece 1A at 4 cm.

UNIT 12: APHYRIC BASALT

Pieces: 1B, 1C, 2, 3, and 7

CONTACTS: The irregular contact between Units 11 and 12 is recovered in Pieces 1A–1C and in Piece 7. Unit 11 has a chilled margin adjacent to the contact; Unit 12 has no chilled margins.

GROUNDMASS: Fine grained.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

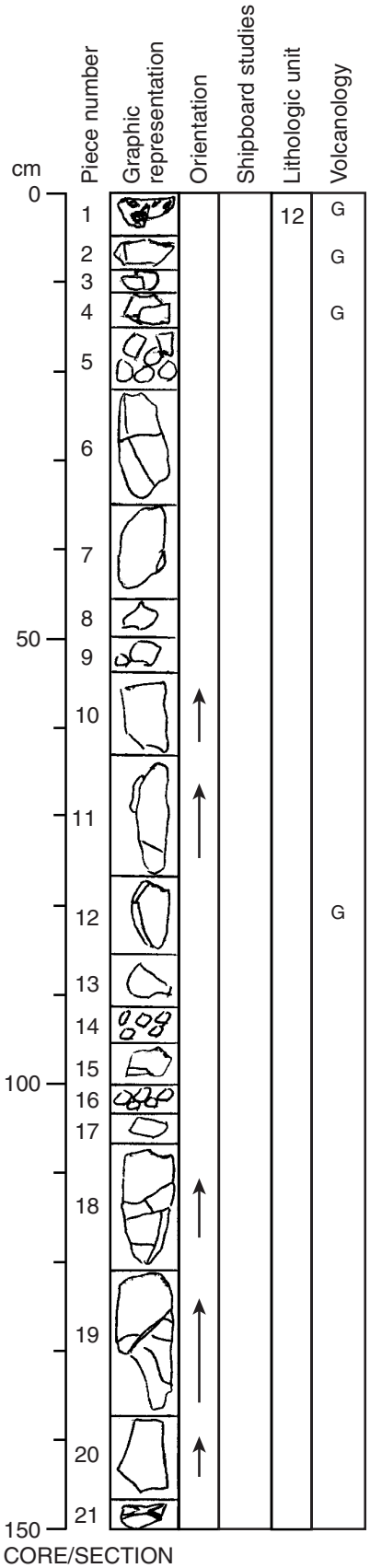
STRUCTURE: Massive.

ALTERATION: Moderate. In Pieces 1B and 1C, Unit 12 has an alteration halo (bluish gray: 5B 6/1) parallel to the unit boundary.

Description of thin section at 42-43 cm

Whole-rock ICP-AES data

Core Photo



192-1185B-23R-1 **Section Top: 482.80 mbsf**

UNIT 12: MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–21

CONTACTS: None.

PHENOCRYSTS:

	% Grain Size (mm): Mode	Max	Min	Avg.	Shape/Habit
Olivine:	2–4	2	0.5	1	Subhedral to euhedral

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6).

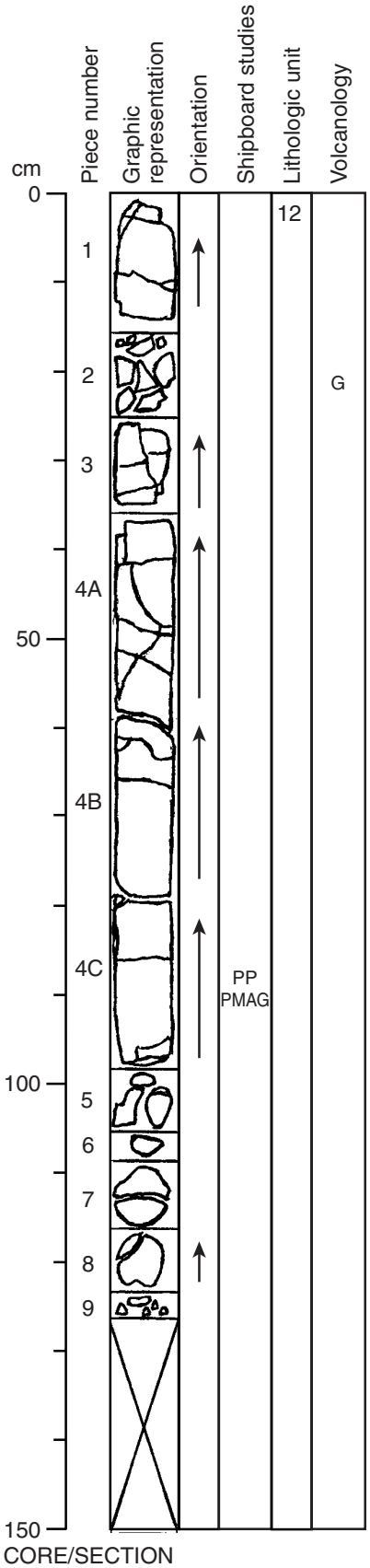
STRUCTURE: Pillowed. Pillows are inferred on the basis of variations in groundmass grain size (within different pieces) and the brecciated fragments in Piece 1–4.

ALTERATION: Moderate. Olivine phenocrysts are replaced by black clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-3 mm wide and are filled with carbonate. Carbonate is also present on the sides of Pieces 11–12, 14–15 and 18–20. Euhedral quartz crystals are present on Piece 11.

COMMENTS: Pieces 1 to 4 are breccia consisting of angular aphanitic basalt clasts and fresh glass in carbonate cement.

Core Photo



192-1185-23R-2 **Section Top: 484.30 mbsf**

UNIT 12: SPARSELY OLIVINE-PHYRIC BASALT

Pieces: 1–9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1-2	1.2	0.2	0.6	Euhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Aphanitic to fine grained. Fine-grained regions have variolitic texture.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to medium gray (N5).

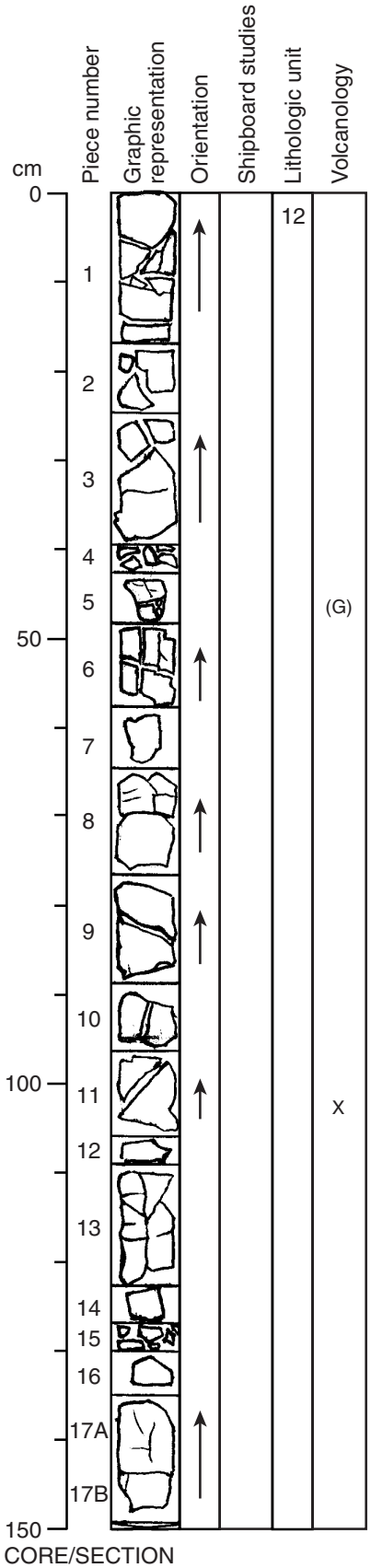
STRUCTURE: Pillowed. A glassy margin is present on Piece 1 of the working half, and groundmass grain size variations are consistent with a pillowed sequence.

ALTERATION: Sparse to moderate near veins. Brown oxidation halos are present. Olivine phenocrysts are replaced by black clay.

VEINS/FRACTURES: Moderately veined. Veins are <1-4 mm wide and are filled with Fe oxyhydroxide, carbonate and green-black clay.

COMMENTS: Irregular miarolitic cavities (~1 mm) are filled with green-black clay.

Core Photo



192-1185B-24R-1 **Section Top: 492.50 mbsf**

UNIT 12: SPARSELY TO MODERATELY OLIVINE-PHYRIC BASALT

Pieces: 1–17B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max	Min	Avg.	Shape/Habit
Olivine:	1–4	1.1	0.3	0.5	Euhedral to subhedral; commonly in glomerocrysts

Olivine phenocrysts are unevenly distributed.

GROUNDMASS: Aphanitic to fine grained. Aphanitic pieces have a poorly developed spherulitic texture (e.g., Piece 14) and fine-grained pieces have variolitic texture (e.g., Piece 4).

VESICLES: Nonvesicular.

COLOR: Light gray (N7) to medium bluish gray (5B 5/1).

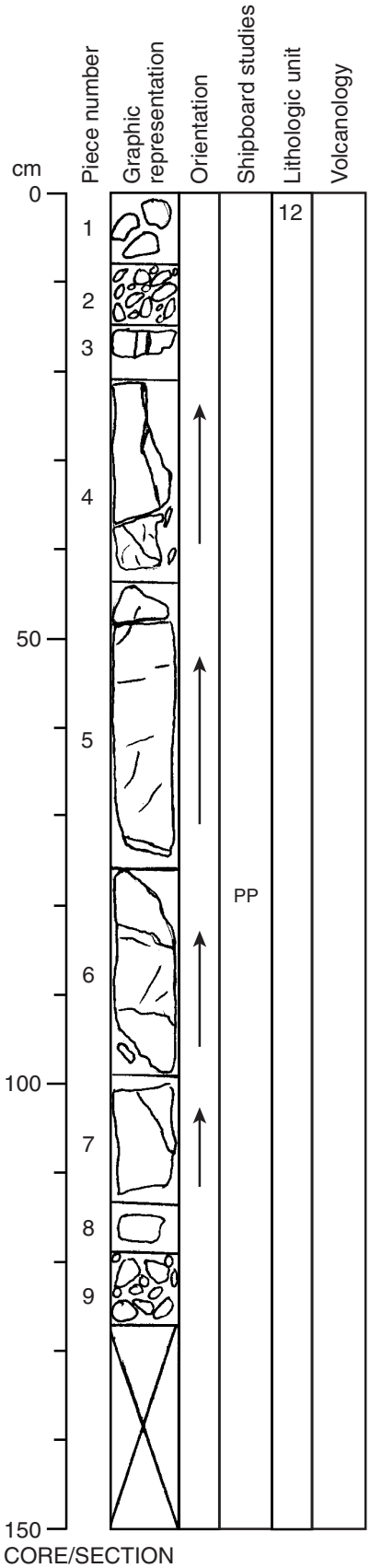
STRUCTURE: Pillowed. Pillows are defined on the basis of groundmass grain size variations, but no glassy margins are present.

ALTERATION: Moderate. Alteration halos containing Fe oxyhydroxide are present around veins. Olivine phenocrysts are replaced by green-black clay.

VEINS/FRACTURES: Sparsely to moderately veined. Veins are <1-4 mm wide and are filled with carbonate and green clay.

COMMENTS: Pieces 16 and 17A–B have coarser grain size relative to the other pieces in this section, and are similar to those in Section 24R-2. Piece 11 contains two plagioclase xenocrysts (~1 mm) at 102–103 cm.

Core Photo



192-1185B-24R-2 **Section Top: 493.99 mbsf**

UNIT 12: APHYRIC BASALT

Pieces: 1–9

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max	Min	Avg.	Shape/Habit
Olivine:	<1	1	0.3	0.5	Subhedral to euhedral

GROUNDMASS: Fine grained with variolitic texture; contains olivine, plagioclase and clinopyroxene.

VESICLES: Nonvesicular.

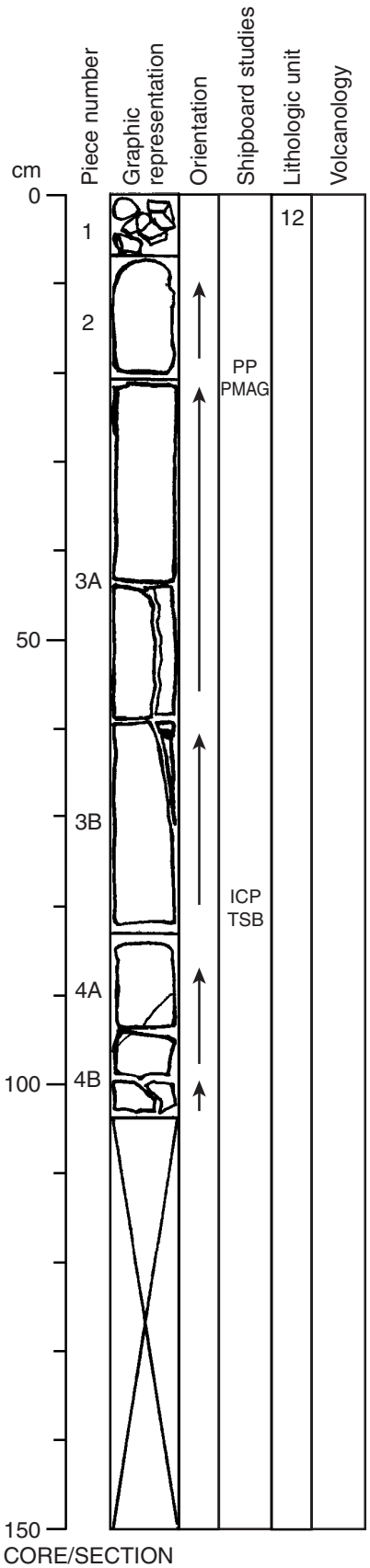
COLOR: Greenish gray (5GY 6/1) to medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are replaced by black clay. Brown and green alteration halos are present.

VEINS/FRACTURES: Moderately veined. Veins are <1-7 mm wide and are filled with Fe oxyhydroxide, carbonate, and minor zeolite.

Core Photo



192-1185B-28R-1 **Section Top: 517.60 mbsf**

UNIT 12: APHYRIC BASALT

Pieces: 1–4B

CONTACTS: None.

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene, black oxides and euhedral to subhedral olivine. Olivine crystals are commonly present in clusters.

VESICLES: Nonvesicular.

COLOR: Medium light gray (N6) to light gray (N7).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine is replaced by black clay.

VEINS/FRACTURES: Sparsely veined. Veins are <1 mm wide and are filled with black and green clay and celadonite.

COMMENTS: The lowermost four centimeters of Piece 4B are aphanitic and moderately olivine-phyric (~3% phenocrysts). The transition from fine grained to aphanitic occurs over a ~2-mm interval. An irregularly shaped coarser-grained patch is present within the aphanitic region.

Description of thin section at 80-82 cm

Whole-rock ICP-AES data

Site 1185 Smear Slisdes

Site	Hole	Core	Type	Section	Top (cm)	Depth (mbsf)	Lithology	T-Sand	T-Silt	T-Clay	M-Biotite	M-Calcite	M-Carbonate	M-Clay	M-Feldspar	M-Glauconite	M-Opaques	M-Plagioclase	M-Pyrite	M-Pyroxene	M-Quartz	M-Unspecified Minerals	M-Volcanic Glass	M-Zcolite	B-Diatoms	B-Ebridians	B-Foraminifers	B-Nannofossils	B-Radiolarians	B-Siliceous Sponge Spicules	B-Silicoflagellates	B-Sponge Spicules	B-Organic debris	R-Lithic Fragments	Comments
1185	A	2	R	1	74	251.34	D	10	20	70																		85	12	3					
1185	A	2	R	2	58	252.68	M	0	5	95												2						95	2	1					Reddish translucent minerals? (burrow infill)
1185	A	3	R	2	20	261.9	D	8	10	82																		82	13	5					
1185	A	4	R	2	57	271.37	M	25	5	70							5											64	30	1					Dark burrow fill
1185	A	5	R	1	30	279.8	D	25	5	70																		70	25	5					
1185	A	6	R	1	40	289.5	D	10	15	75																		75	20	5					
1185	A	7	R	2	40	300.7	D	13	20	67																		67	28	5					
1185	A	7	R	CC	7	301.41	M	20	75	5												99						1							Green-colored small particle. nodule?
1185	B	2	R	1	60	308.6	D	10	20	70																		80	15	5					

Site 1185 Sediment Thin Section Descriptions

Hole	Core	Sec	cm	Location	% Carb	Facies name	Description	Figure number or Photomicrograph ID#	Microfossils and environment
Unit II Nannofossil chalk with radiolarians to radiolarian nannofossil chalk									
1185A	2R	2	62-65	Dominant facies	2R-2, 59-61 cm, 90.42%	nannofossil chalk with radolarians	Abundant radiolarians in matrix composed probably of nannofossils. Opaques are rarely observed. Pyrite?	See **Chapter 5, Figure F10** (1185AS-13) See photomicrograph **1185AS-14**	The sample is a nannofossil/radiolarian wackestone, with abundant radiolarian bioclasts evidencing a chaotic distribution and no preferred orientation. Planktonic foraminifera are few, but show a wide size distribution and relatively high species diversity. Burrows and fecal pellets are visible. The deposit is deep-water pelagic mud, characterized by moderately-high-surface-water, siliceous microfossil productivity, relatively slow sedimentation rates and much bioturbation. The planktonic foraminifer assemblage indicates no major dissolution effects; deposition was above the foraminifer lysocline. Planktonic foraminifer species include *Globigerina euapertura*, *G. venezuelana*, *G. ampliapertura*, *Tuborotalia cerroazulensis* and *Pseudohastigerina micra*
1185A	4R	1	22-25	Dominant facies	4R-1, 24-26 cm, 85.42%	radiolarian nannofossil chalk	Abundant radiolarians in matrix composed probably of nannofossils. Occasionally radiolarians are accumulated. Winnowing? Opaques are observed. Pyrite?	See photomicrograph **1185AS-15**	A nannofossil/radiolarian wackestone, the sample is very similar to that in sample 2-2, 62-65cm. Radiolaria are abundant and show no signs of sorting or preferred orientation. Burrowing and fecal pellets are evident. However, planktonic foraminifera are extremely rare (three specimens) and poorly preserved. The interval is therefore like the 2-2, 62-65cm sample in being representative of a deep-water pelagic mud, characterized by moderately-high-surface-water, siliceous microfossil, productivity, relatively slow sedimentation rates and much bioturbation. It differs, however, if being deposited below the planktonic foraminifer lysocline. The dominance of radiolaria may thus be due to preservational bias. However, sample 2-2, 62-65cm indicates that radiolarian dominance reflects the actual surface water pelagic taxonomic composition. Planktonic foraminifer species evident are *Globigerina euapertura* and *G. yeguaensis*.
1185A	5R	1	21-24	Dominant facies	5R-1, 26-27 cm, 87.39%	radiolarian nannofossil chalk	Abundant radiolarians. Radiolarian fragments are concentrated (1185AS-16).	See photomicrographs **1185AS-16**, **1185AS-17**	As above: a nannofossil/radiolarian wackestone; abundant radiolaria; no signs of sorting or preferred orientation; burrowing and fecal pellets are evident; deep-water pelagic mud, characterized by moderately-high-surface-water, siliceous microfossil, productivity, relatively slow sedimentation rates and much bioturbation. Planktonic foraminifera remain rare and poorly preserved, but are greater in number (9 specimens) than in core 4 which likely marks the greatest excursion below the foraminifer lysocline. Planktonic foraminifer species include *Globigerina euapertura*, *Tuborotalia cerroazulensis* and *Globigerinatheka subconglobata*.
1185A	6R	1	5-8	Dominant facies	6R-1, 8-9 cm, 87.53%	radiolarian nannofossil chalk	Abundant radiolarians. Radiolaria includes brownish minerals (1185AS-18).	See photomicrographs **1185AS-18**, **1185AS-19**	As above: a nannofossil/radiolarian wackestone; abundant radiolaria; no signs of sorting or preferred orientation; burrowing and fecal pellets are evident; deep-water pelagic mud, characterized by moderately-high-surface-water, siliceous microfossil, productivity, relatively slow sedimentation rates and much bioturbation. Planktonic foraminifera are very rare (6 specimens) and poorly preserved, indicating continued deposition just below the foraminifer lysocline. Definite species identification is not possible, but specimens resembling *Globigerina euapertura* and *Globigerinatheka subconglobata* are evident. The occurrence of rare deep-water, non-calcareous, agglutinated benthic species indicates a minor influx of non-calcareous (volcanic?) detrital grains. Species include *Rhabdammina abyssorum* and *Hormosinella ovicula*.
1185A	7R	1	89-92	Dominant facies	7R-1, 93-94 cm, 84.61%	radiolarian nannofossil chalk	Abundant radiolarians. Pores of radiolarians are occasionally filled by micritic calcite. Usually they are void.	See photomicrograph **1185AS-20**	The interval is a nannofossil/radiolarian wackestone that is similar to the above section; radiolarians are abundant and show no evidence of sorting or preferred orientation. However, there are far fewer signs of bioturbation and planktonic foraminifera are frequent, although preservation remains poor. The nature of the planktonic foraminifer assemblage is uncertain. The dominance of large, thick-walled species such as *Globigerina senni* and *Globigerinatheka index* indicates a dissolution assemblage and continued deposition near the foraminifer lysocline. However, other, thick-walled taxa endemic in the middle Eocene (such as Acarinina spp.) are absent, but very small, thin-walled species (e.g., *Pseudohastigerina micra*) are present, as in sample 2-2, 62-65cm. The possibility therefore exists that the evident assemblage is indicative of an abnormal (cold water?) middle Eocene, surface water paleoecology. Less obvious signs of bioturbation may indicate greater rates of sedimentation resultant from less primary dissolution.

Site 1185 Sediment Thin Section Descriptions

Hole	Core	Sec	cm	Location	% Carb	Facies name	Description	Figure number or Photomicrograph ID#	Microfossils and environment
1185A	8R	1	3-6	Dominant facies		nannofossil chalk with radolarians	Poorly preserved radiolarians and nannofossils. Poorly preserved foraminifer?[PHOTO 1185AS-21] Unspecified brownish minerals are common (Goethite?) [PHOTO 1185AS-22].	See photomicrographs **1185AS-21**, **1185AS-22**, **1185AS-23**	The sample is derived from tan-brown limestone immediately overlying the top of the basalt recovered in core 8. Bioclast texture is similar to the above interval, with dominant radiolarians, frequent planktonic foraminifera and extensive bioturbation of what appears to be autochthonous pelagic deposit. However, overall bioclast abundance is slightly less, frequent volcaniclastic grains are evident and benthic foraminifera are more common. Also, extensive recrystallization has occurred; radiolaria are very poorly preserved and calcified, whereas planktonic foraminifera evidence considerable dissolution. Planktonic foraminifer diversity is relatively high and includes dissolution-prone species, indicating that the corrosion is not primary and reflects the recrystallization of the deposit. The presence of the taxon *Tuborotalia cerroazulensis*, which has a first occurrence in mid-Zone P12, indicates the section is no older than the overlying interval.
1185A	10R	1	38-40	Dominant facies		nannofossil chalk with radolarians? and foraminifers?	Recrystalized ghosts are foraminifers or radiolarians?. Brownish minerals are common. Goethite?	See **Chapter 5, Figure F15** (1185AS-25) See photomicrograph **1185AS-24**	The thin-section was made from a thin limestone layer intercalated with the upper basalt section in Hole 1185A. Although heavily recrystallized, common bioclasts are evident and indicate what originally was a nannofossil/radiolarian/planktonic foraminifer wackestone. The foraminifera are common, but very small. Radiolarians are abundant, but calcified and highly corroded. The sample probably is indicative of an autochthonous, pelagic deposit of indeterminate paleobathymetry. No primary dissolution is likely, based upon the very small size of the planktonic foraminifera. Foraminifer specimens resembling, in gross morphology, the species *Blefuscuiana daminae* and *B. gorbachikae* are present, but conceivably may also be very small specimens of some species of *Hedbergella*, such as *H. delrioensis*. Although an undifferentiated Cretaceous age is indicated, no further definite age refinement is possible because the original wall structure of the specimens has been lost to recrystallization. If present, the co-occurrence ofB. daminae and B. gorbachikae would indicate a latest Aptian to lowermost Albian age for the unit (gorbachikae to planispira zones). With reference to the Cretaceous section at Site 1183, two biofacies similar to that evident in this sample were noted. The older occurred in the limestone immediately overlying the basalt section (Samples 192-1183A-54R-3, 59-61cm, and 54-3, 96-99cm). The youngest occurred in the upper Albian section (Samples 51-3, 13-15cm, and 52-1, 139-141cm). As noted, gross morphology of the planktonic foraminifers in this sample would indicate an affinity to the Aptian section of Hole 1183A. However, rare nannofossil recovery indicates a late Albian age for this section and thus a possible correlation to the later radiolarian influx in Hole 1183A.
1185A	10R	1	48-51	Dominant facies		nannofossil chalk with radolarians? and foraminifers?	Recrystalized ghosts are foraminifers or radiolarians?. Brownish minerals are common. Goethite? Veins are often observed.	See photomicrographs **1185AS-1**, **1185AS-2**, **1185AS-3**, **1185AS-4**, **1185AS-5**	The sample is very similar to the section from Sample 10-1, 6, 38-40cm, but much more extensively recrystallized. A vein of very coarsely crystalline calcite occurs on the upper left of the thin-section. Irregular, sparry spherical areas are common and likely indicate highly recrystallized spherical radiolaria. Rare, tiny outlines of planktonic foraminifera, similar to those described above, are also present. Overall bioclast abundance appears much lower than in the 10-1, 6, 38-40cm sample, but comparative estimates of microfossil abundance in such highly altered limestones are unreliable. The sample presumably is of the same biofacies and age as the 10-1, 6, 38-40cm sample.

TS# 113 192-1185A-8R-1, 15-18 cm, Piece 2 | **Unit 1** | **OBSERVER:** | **PRC, WJC, TS, SPI, CRN, RVW**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Near the top of the unit, below the glassy rim.**
GRAIN SIZE: **Cryptocrystalline to microcrystalline.**
TEXTURE: **Isolated or coalesced spherulites present.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	4	5	<0.05	0.7	0.25		Subhedral to euhedral	Contains glass inclusions.
GROUNDMASS								
Olivine	1	5			<0.01		Elongate, some skeletal	Concentrated in spherulites; conspicuous because of alteration.
Devitrified glass with dendrites	85	90	<0.01	~0.05				Devitrified to fine dendrites of indeterminate composition.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<<1	<<1	<0.01	~0.025	<0.01		Mostly euhedral octahedra	Often present as inclusions in olivine phenocrysts.
Sulfide	<<1	<<1		<0.01			Blebs	

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	5	0				Groundmass and some olivine in spherulites	
Fe oxhydroxide	5	0				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS		LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : Spherulites consist of radiating fibers of plagioclase, olivine and clinopyroxene.
See **Chapter 5**, **Figure F32**, **Figure F33**, **Figure F34**, **Figure F36**; see photomicrographs **1185A-113**, **1185A-114**, **1185A-115**, **1185A-116**, **1185A-117**, **1185A-120**, **1185A-122**, **1185A-124**, **1185A-125**, **1185A-126**, **1185A-127**

TS# 114 192-1185A-8R-1, 25-29 cm, Piece 3 | **Unit 1** | **OBSERVER:** | **WJC, CRN, LMC, TS, MG**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Altered basalt below pillow rim.**
GRAIN SIZE: **Microcrystalline to cryptocrystalline.**
TEXTURE: **Variolitic to spherulitic (transition zone).**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	5	0.04	0.4	0.08		Euhedral to subhedral	
GROUNDMASS								
Plagioclase	5	5	<0.01	<0.01	<0.01		Elongate	Spherulitic to variolitic.
Olivine	0	5			<0.01		Elongate, some skeletal	Conspicuous because of alteration.
Devitrified glass	0	85					Cryptocrystalline	Devitrified to fine dendrites too small to identify.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<1	<1	<0.01	0.03	<0.01		Euhedral, octahedra	A few have overgrowths of titanomagnetite (altered to maghemite?); mostly present as inclusions in olivine phenocrysts.
Titanomagnetite	<1	<1	<0.01	<0.01	<0.01		Skeletal, anhedral	Some or all altered to maghemite.
Sulfide	<<1	<<1					Blebs	Two phases; the less abundant phase may be pentlandite.

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	85	0				Olivine and devitrified groundmass	
Maghemite	Trace	0				Titanomagnetite	
Fe oxyhydroxide	10	0				Olivine and devitrified groundmass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS		LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Anastamosing				0.06	0.03	Calcite	

COMMENTS : Almost completely altered. Fine-grained opaques (now maghemite) are finely disseminated.
See photomicrographs **1185A-134**, **1185A-135**, **1185A-136**

TS# 115 192-1185A-8R-1, 140-141 cm, Piece 13 **Unit 1** **OBSERVER:** **WJC, RVW, LMC, TS, CRN, SPI**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Altered basalt fragments.**
GRAIN SIZE: **Microcrystalline.**
TEXTURE: **Intersertal to variolitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	10	0.05	0.4	0.1		Euhedral to subhedral	Highlighted by alteration.
GROUNDMASS								
Plagioclase	55	55	<0.01	0.2	0.03		Elongate, skeletal, thabular	
Clinopyroxene	32	32	<0.01	0.4	0.05		Anhedral	
OPAQUE/ OXIDE MINERALS								
Cr spinel	<1	<1	0.01	0.06	0.04		Euhedral, octahedra	Present as inclusions in olivine.
Titanomagnetite	1	3	<0.01	0.05	0.01		Skeletal, irregular	Some are mostly altered to maghemite with remnants of titanomagnetite remaining in the crystal interiors.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	10	0.05	0.4	0.1	Olivine	
Maghemite	2				Titanomagnetite	
Fe oxyhydroxide	Trace				Olivine	Silicate minerals stained by alteration in brown halos.
Calcite	<1				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS

VEINS	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Anastamosing				0.1	Brown smectite and goethite	Single small, branching vein.

COMMENTS : Two alteration halos cross the thin section (associated with veins located outside of thin section), creating areas that are more highly altered. Two types of opaques are observed: 1) early Cr spinel; 2) late titanomagnetite in groundmass.
See photomicrograph **1185A-128**

TS# 116 192-1185A-9R-2, 10-13 cm, Piece 1 **Unit 2** **OBSERVER:** **PRC, LMC, CRN, TS, SPI**

ROCK NAME: **Sparsely olivine-phyric basalt.**
WHERE SAMPLED: **Altered pillow chill margin.**
GRAIN SIZE: **Hypohyaline to cryptocrystalline.**
TEXTURE: **Spherulitic to variolitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	2	<0.1	0.4	~0.1		Euhedral	Sometimes present as glomerocrysts.
GROUNDMASS								
Plagioclase	5	10	<0.01	0.01	<0.01		Cryptocrystalline to skeletal and acicular	
Olivine	0	10	<0.01	0.03	<0.01		Cryptocystalline to skeletal and elongate, dendritic	Elongate brown crystals are altered and have a straight extinction.
Mesostasis	30	77						Radiating fibers of spherulites are inferred to be plagioclase, olivine and clinoyproxene; glass is interstitial to the cryptocrystalline fibers.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	~1	~1		<0.05			Rhombhedral to anhedral	Very fine grained; generally altered to maghemite, but some grains are unaltered.
Cr spinel	<<1	<<1		0.08			Euhedral to subhedral	High relief; brown; often present as inclusions in olivine phenocrysts.
Sulfide	<<1	<<1			<0.01		Blebs	Present in altered olivine phenocrysts.

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown and yellow smectite	62	0				Olivine and mesostasis	
Fe oxyhydroxide	2	0				Olivine and mesostasis	Provides the overall reddish-brown color of thin section.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS

VEINS		LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
		Center of slide	0.25	3	0.3	Smectite at vein margins and calcite in center	

COMMENTS : This section was taken mainly for its veins and alteration state. The original texture is one that typifies the spherulitic zone of pillow lava.

TS# 117 192-1185A-10R-1, 38-40 cm, Piece 6 — **Unit 5A** — **OBSERVER:** **RVW, CRN, LMC, TS**

ROCK NAME: **Moderately vesicular olivine-phyric basaltic glass.**
WHERE SAMPLED: **Interpillow sediment in contact with basaltic glass.**
GRAIN SIZE: **Holohyaline.**
TEXTURE: **Porphyritic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	5	8	0.03	0.14	0.1		Euhedral to subhedral	Variably altered.
GROUNDMASS								
Glass	77	77						Altered to zeolite along contact with limestone; otherwise fresh.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<1	<1	<0.01	0.01	~0.01		Euhedral	Present as inclusions in olivine phenocrysts.
Sulfide	<1	<1					Blebs or angular	Slightly anisotropic: pyrrhotite?

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	2				Olivine	
Fe oxyhydroxide	1				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) av.	SIZE (mm) wide	SIZE (mm) long	FILLING / MORPHOLOGY	COMMENTS
Vesicles	15	Throughout		0.01	0.1	Elongate; unfilled	Vesicles 'wrap' around olivine phenocrysts; vesicle-poor zone immediately adjacent to phenocrysts.

VEINS	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS

COMMENTS : The thin section consists mainly of limestone. Only the igneous portion of the slide is described here. Zeolites are present close to the contact with the limestone.
See **Chapter 5, Figure F26**

TS# 118 192-1185A-10R-1, 48-51 cm, Piece 7 | **Unit 5A** | **OBSERVER:** | **RVW, LMC, CRN, TS**

ROCK NAME: **Moderately vesicular olivine-phyric basaltic glass.**
WHERE SAMPLED: **Interpillow limestone in contact with basaltic glass.**
GRAIN SIZE: **Holohyaline.**
TEXTURE: **Porphyritic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	5	5	0.01	0.05	0.03		Euhedral to subhedral	Glomerocrysts of up to five olivine crystals.
GROUNDMASS								
Glass	60	90						
Cryptocrystalline groundmass	30	0						Result of local devitrification of glass.
OPAQUE MINERALS								

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS

VESICLES/ CAVITIES	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	5	5			0.01	Spherical to elongate	Unfilled.

VEINS	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS

COMMENTS : The thin section consists mainly of limestone. Only the igneous portion of the slide is described here. Zeolites and coarsely-crystalline calcite are present close to the contact with the limestone. Spherulites of yellow clay are present at the margin of the glass.

TS# 119 192-1185A-10R-3, 51-54 cm, Piece 1B **Unit 5B** **OBSERVER:** **PRC, RVW, LMC, TS, SPI, CRN**

ROCK NAME: **Moderately olivine-phyric basalt.**

WHERE SAMPLED: **Massive flow interior (below geochemical reference sample).**

GRAIN SIZE: **Holocrystalline; fine grained.**

TEXTURE: **Variolitic to subophitic with some spherulitic regions; intrafasciculate.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	~3	0.15	0.4	0.2		Subhedral to euhedral	More euhedral than groundmass olivine.
Plagioclase	<<1	<<1	0.3	0.6	0.4		Anhedral to subhedral laths	More equant than the groundmass plagioclase.
GROUNDMASS								
Plagioclase	44	45	<0.1	0.3	0.1		Fibrous, skeletal, subhedral	Range from fibrous crystallites to skeletal, elongated laths.. Some laths are up to 4 mm long.
Olivine	0	8	<0.1	0.3	0.1		Anhedral to subhedral	Generally interstitial to other groundmass phases.
Clinopyroxene	40	40	<0.1	0.4	0.15		Fibrous to subhedral	
Glass	0	2					Mesostasis	Interstitial.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	2	2	<0.01	0.15	~0.1		Skeletal to anhedral	
Cr spinel	<<1	<<1	<0.01	0.02	0.01		Subhedral to euhedral	Brown; high relief.
Sulfide	<<1	<<1	<0.01	<0.1	<.01		Blebs	

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	14					Olivine, plagioclase, glass and vesicle	
Celadonite	Trace						
Maghemite	<<1	<<1				Anhedral	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicle	One				0.6	Brown smectite at edge => fibrous brown smectite in center	Round.

VEINS		LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : Almost all olivine crystals are smaller than the groundmass plagioclase and clinopyroxene; some olivine grains appear to be skeletal. Relict Cr spinels are present in olivine pseudomorphs and sometimes skeletal plagioclase; they are reacting to titanomagnetite.

See **Chapter 5, Figure F39**; see photomicrographs **1185A-129**, **1185A-133**

TS# 120 192-1185A-10R-2, 3-6 cm, Piece 1A **Unit 5B** **OBSERVER:** **RVW, TS, CRN**

ROCK NAME: **Moderately olivine-phyric basalt.**

WHERE SAMPLED: **Spherulitic altered basalt.**

GRAIN SIZE: **Hypohyaline; locally cryptocrystalline.**

TEXTURE: **Porphyritic with cryptocrystalline and dendritic groundmass; isolated or coalesced spherulites present.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	2	5	0.02	0.4	0.2		Euhedral to subhedral	Contains melt inclusions.
GROUNDMASS								
Olivine	5	10			<0.01		Elongate to dendritic	Elongate olivines appear to grow from olivine phenocrysts.
Mesostasis	55	85					Brown; crptocrystalline	Interstitial to olivine dendrites; altered to brown clay but difficult to assess the proportion altered.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<<1	<<1	<0.01	0.02	0.01		Equant and euhedral	Inclusions in olivine phenocrysts and in groundmass.
Titanomagnetite	Trace	Trace			<0.01		Euhedral	Rarely as overgrowths on Cr spinel; may be maghemitized.
Sulfide	Trace	Trace			<0.01		Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	35				Olivine, vein and mesostasis	
Fe oxyhydroxide	2				Olivine	
Calcite	<1				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS

VEINS		LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Several		Close to top of section	0.2	0.8	0.5	Calcite	Minor phillipsite is present, and vein walls are lined with colorless smectite.

COMMENTS : Some spherulites are present; they have brown cryptocrystalline centers and fibrous pale brown crystals in outer layer. Most of the thin section is within a brown alteration halo, wherein the olivine is almost completely replaced by Fe oxyhydroxide and brown smectite. Olivine phenocrysts in the gray part of the thin section are predominantly unaltered.
See **Chapter 5, Figure F37**, **Figure F38**; see photomicrograph **1185A-131**

TS# 121 192-1185A-11R-1, 83-86 cm, Piece 4B | **Unit 5B** | **OBSERVER:** | **WJC, TS, PRC, CRN**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Pillow interior.**
GRAIN SIZE: **Holocrystalline; fine grained.**
TEXTURE: **Variolitic, subophitic and intrafasciculate.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	2	5	0.25	2	0.5		Euhedral, skeletal	Contain glass inclusions.
Plagioclase	Trace	Trace			0.3		Subhedral, platy laths	
GROUNDMASS								
Plagioclase	50	50	0.01	0.2	0.1		Subhedral, fibrous to skeletal	
Olivine	10	19	0.01	0.15	0.1		Anhedral to subhedral	
Clinopyroxene	20	20	0.01	0.15	0.1		Subhedral to anhedral	
Mesostaasis	0	5					Interstitial	Devitrified and altered glass.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	1	1	<0.01	0.05	0.02		Skeletal to subhedral	
Cr spinel	<1	<1	<0.01	0.02	0.01		Subhedral to euhedral	Associated with olivine.
Sulfide	<1	<1			<0.01		Blebs	Possibly pentlandite.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	15				Olivine and mesostasis	
Fe oxyhydroxide	2				Olivine	
Calcite					Olivine, mesostasis and vein	
Maghemite	Trace			<0.01	Titanomagnetite	Anhedral.
Celadonite	Trace				Plagioclase	Close to veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
One	<1				0.25	Smectite	Round.

VEINS	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
One	Near corner of slide	<0.01	0.15	0.1	Smectite, celadonite, Fe oxyhydroxide, calcite	

COMMENTS : This section contains two alteration halos perpendicular to each other; the thinner one is clearly associated with a vein in the upper right corner. Fe oxyhydroxide staining (and olivine replacement) occurs only within the halos; sulfides are less abundant or absent within the halos.
See **Chapter 5, Figure F31**; see photomicrographs **1185A-140**, **1185A-142**

TS# 122 192-1185B-3R-1, 94-97 cm, Piece 16 **Unit 1** **OBSERVER:** **TS, SPI, CRN, LMC, RVW, MG, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**

WHERE SAMPLED: **Near the glassy rim.**

GRAIN SIZE: **Aphanitic to hypohyaline.**

TEXTURE: **Porphyritic with dendritic and cryptocrystalline groundmass; locally spherultic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	3	5	0.05	0.4	0.15		Euhedral to subhedral	Contains many glass inclusions; present as glomerocrysts; altered adjacent to veins.
GROUNDMASS								
Olivine	6	16	<0.01	0.02	0.01		Dendritic, elongate and skeletal	Elongate olivine form the nuclei of spherulites. Two generations of groundmass olivine: (1) Elongate (altered), and (2) skeletal (unaltered).
Devitrified glass	79	79					Interstitial	Contains olivine dendrites.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<0.5	<0.5		<0.01	<0.01		Subhedral to euhedral	Inclusions in olivine phenocrysts and as discrete euhedral crystals.
Sulfide	<1	<1		<0.01	<0.01		Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite + zeolites	12				Olivine, veins	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		Middle of slide	0.2	1.3	0.7	Smectite, opaques, locally goethite, Fe oxyhydroxide and zeolites	Zeolites include phillipsite and analcite (?).

COMMENTS : Thin section was taken primarily for alteration. Brown and gray halos are associated with the two veins. Unaltered olivine is present within the alteration halos. Three generations of olivine are present (phenocrysts, elongate, and skeletal). Spherulites are the loci for alteration. This sample was also analyzed by ICP-AES.

See **Chapter 5, Figure F29**; see photomicrograph **1185B-177**

TS# 123 192-1185B-3R-2, 79-82 cm, Piece 8 **Unit 1** **OBSERVER:** **TS, CRN, SPI, LMC, RVW, MG, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**

WHERE SAMPLED:

GRAIN SIZE: **Fine grained.**

TEXTURE: **Variolitic and intersertal.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	2-6	0.1	0.6	0.25		Subhedral to euhedral	Phenocrysts are irregularly distributed.
GROUNDMASS								
Plagioclase	30	30					Elongate to skeletal	Forms variolites with clinopyroxene and olivine.
Olivine	0	10					Elongate	
Clinopyroxene	10	10					Elongate	
Devitrified glass	32	42						
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	0	2	<0.01	0.02	0.01		Euhedral to skeletal	
Maghemite	2	0	<0.01	0.02	0.01		Anhedral to rhombs	Replaces the titanomagnetite.
Cr spinel	<1	<1	0.01	0.04	0.02		Subhedral to anhedral	Associated with altered olivine.
Sulfide	Trace	Trace		<0.01			Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	3				Olivine	
Smectite	23				Olivine	
Carbonate	<1				Plagioclase (?) and rare miarolitic cavities	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes	<1	Middle of slide	0.3	0.5	0.4	Lined with smectite, Fe oxyhydroxide and carbonate	

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		Top of slide			>100	From wall to center: brown smectite, and calcite with opaques	

COMMENTS : This thin section was taken primarily for alteration.

TS# 124 192-1185B-4R-7, 44-46 cm, Piece 1C | **Unit 2** | **OBSERVER:** | **TS, SPI, CRN, LMC, RVW, WJC, MG**

ROCK NAME: **Sparsely olivine-phyric basalt.**
WHERE SAMPLED: **Pillow interior.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic, intergranular to intersertal.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	<1	0.15	0.4	0.2		Subhedral	Irregular distribution.
GROUNDMASS								
Plagioclase	40	42	0.01	0.15	0.1		Euhedral to elongate; some are skeletal	Forms variolites with clinopyroxene.
Clinopyroxene	36	37	<0.01	0.15	0.1		Anhedral to elongate	
Devitrified glass	0	20					Interstitial	Probably fibrous crystallites of clinopyroxene and plagioclase.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	<1	<1	<0.01	0.03	0.01		Euhedral to skeletal	
Cr spinel	Trace	Trace	0.01	0.03	0.02		Euhedral	Associated with altered olivine phenocrysts. Can also be present with titanomagnetite margins.
Sulfide	Trace	Trace			<0.01		Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	23				Olivine and mesostasis	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Miarolitic cavity						Brown smectite	May be plucked out olivine? Plagioclase crystals poke into the cavity.

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : This sample was also analyzed by ICP-AES.
See **Chapter 5, Figure F40**; see photomicrographs **1185B-169**, **1185B-172**

TS# 127 192-1185B-4R-1, 142-144 cm, Piece 18 | **Unit 2** | **OBSERVER:** | **TS, LMC, CRN, RVW, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Near the glassy rim.**
GRAIN SIZE: **Cryptocrystalline to aphanitic.**
TEXTURE: **Porphyritic with dendritic and cryptocrystalline groundmass; locally spherulitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	3	4	0.05	0.6	0.15		Euhedral	
GROUNDMASS								
Olivine	5	10	<0.01	0.02	0.01		Elongate and dendritic/skeletal	Two generations of groundmass olivine: (1) elongate (altered) crystals growing from olivine phenocrysts, and (2) skeletal/dendritic.
Devitrified glass	86	86					Interstitial	Contains dendrites of olivine.
OPAQUE/ OXIDE MINERALS								
Cr spinel	<1	<1	0.01	0.06	0.02		Euhedral to subhedral	Present as inclusions within the olivine phenocrysts.
Sulfide	<1	<1	<0.01	0.02	0.01		Rhombs to blebs	Possibly associated with the alteration?

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	6				Olivine	Especially near to veins.
Fe oxyhydroxyde	<1				Olivine	Especially near to veins.
Celadonite	<1				Olivine	Especially near to veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		Base of slide	1.5	3.5		Zeolite and calcite	A small zeolite filled vein is cut by a larger calcite filled vein.

COMMENTS : This thin section is taken for the study of alteration, this description is of the unaltered region. Brown and gray alteration halos are present. Three generations of olivine are present (phenocrysts, elongate, and skeletal/dendritic).

See **Chapter 5, Figure F50**

TS# 131 192-1185B-5R-2, 135-137 cm, Piece 1D — **Unit 2** — **OBSERVER:** **PRC, TS, LMC, CRN, MG, JH**

ROCK NAME: **Aphyric to sparsely olivine-phyric basalt.**
WHERE SAMPLED: **Fine-grained interior of a pillow.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic; intergranular to intersertal; locally subophitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1-3	0.2	1	0.4		Subhedral to euhedral	Concentrated into bands/regions.
GROUNDMASS								
Plagioclase	49	51	<0.01	0.1	0.05		Fibrous to skeletal, acicular laths	Some are fibrous with clinopyroxene; majority are skeletal and acicular.
Clinopyroxene	38	39	<0.01	0.1	0.05		Fibrous to anhedral and elongate	
Glass	0	5					Mesostasis	
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	~1-2	~1-2	<0.01	0.05	0.02		Skeletal to anhedral	
Cr spinel	<1	<1	<0.01	0.02	0.01		Subhedral to euhedral	Usually large inclusions in olivine. Some of the Cr spinel crystals show reaction to titanomagnetite. Occasional inclusions in plagioclase.
Sulfide	<1	<1	<.01				Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Green and brown smectite	11				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None.							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None.							

COMMENTS : This sample is also analyzed by ICP-AES.
See photomicrographs **1185B-173**, **1185B-174**

TS# 132 192-1185B-6R-1, 37-39 cm, Piece 7 **Unit 5** **OBSERVER:** **PRC, TS, LMC, CRN, RVW, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**

WHERE SAMPLED: **Highly altered; near a pillow margin, with vein.**

GRAIN SIZE: **Hypohyaline to hypocrystalline; aphanitic.**

TEXTURE: **Porphyritic with dendritic and cryptocrystalline groundmass; locally spherultic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	3	4	0.02	0.4	0.2		Subhedral to euhedral	Some have resorbed boundaries and occassionally contain glass inclusions.
GROUNDMASS								
Olivine	2	7	<0.01	0.02	0.01		Elongate to skeletal/dendritic	Some are isolated; some form the nuclei of spherulites.
Devitrified glass	43	89					Intersertal	May contain spherulites of plagioclase and olivine.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	<<1	<<1	<0.01				Blebs	
Sulfide	<1				<0.01		Blebs	
Cr spinel	<<1	<<1	<0.01	0.02	0.01		Subhedral to euhedral	Usually inclusions in olivine.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	28				Glass	
Green smectite	19				Glass and olivine	
Celadonite	<1				Olivine	In halos.
Zeolite	4				Glass and olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes			1.8	2.2	2	Smectite, zeolites (including phillipsite) and goethite	1.8 to 2.2 mm wide alteration halos on either side.

COMMENTS : This section was taken to study a vein and the associated alteration halo. Alteration highlights some of the isolated spherulites even if they are outside the halo. Some olivine within the halos are unaltered.

See photomicrograph **1185B-145**

TS# 133 192-1185B-6R-4, 74-76 cm, Piece 2 **Unit 5** **OBSERVER:** **MG, TS, LMC, CRN, RVW, SPI, JH**

ROCK NAME: **Moderately olivine-phyric basalt**
WHERE SAMPLED: **Flow interior.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Subophitic to variolitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	7	0.07	0.4	0.15		Euhedral to subhedral	
GROUNDMASS								
Plagioclase	45	45	0.05	0.3	0.15		Euhedral to subhedral	Most plagioclase crystals are elongate; several seem to radiate from either a clinopyroxene or a plagioclase. Some tabular plagioclase laths are present.
Clinopyroxene	35	35	0.14	0.4	0.2		Subhedral to anhedral	
Mesostasis	0	10						
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	3	3	0.03	0.15	0.05		Euhedral	Mostly within or around olivine pseudomorphs. Some are slightly altered to maghemite.
Sulfide	<1	<1			0.01		Blebs	Mainly in the glass or associated with olivine.
Cr spinel	<1	<1	<0.01	0.02	0.01		Euhedral	Inclusions in olivine.

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	17	0				Mesostasis and olivine	
Fe oxyhydroxide	<1	0				Olivine	
Celadonite	<<1	0				Mesostasis	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : This sample was also analyzed by ICP-AES. The groundmass grain size has increased to be larger than the euhedral olivines.

TS# 135 192-1185B-8R-1, 76-78 cm, Piece 11 — **Unit 7** — **OBSERVER:** **PRC, LMC, RVW, SPI, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Highly altered pillow rim with vein.**
GRAIN SIZE: **Hyaline to microcystalline.**
TEXTURE: **Trachytic to variolitic; spherulitic zone adjacent to glassy margin.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	5	0.1	0.7	0.4		Subhedral to euhedral	
GROUNDMASS								
Plagioclase	7	10	<0.01	0.02	0.01		Skeletal and acicular microlites	Plagioclase crystals define the subtrachytic texture around the olivine phenocrysts.
Devitrified glass	35	85					Cryptocrystalline	Intergrowths of plagioclase, clinopyroxene and olivine plus interstitial glass.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	~1	~1					Anhedral	Mainly along the margins of olivine phenocrysts.
Cr spinel	<<1	<<1	0.01	0.03	0.02		Subhedral to euhedral	Associated with the olivine pseudomorphs.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	55				Olivine and mesostasis	
Zeolite (?)	2				Olivine	
Fe oxyhydroxide	Trace					Generally occurs with smectite in olivine pseudomorphs.
Iddingsite	Trace				Olivine	
Calcite	<1				Olivine and plagioclase	Along veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes	<<1				0.5	Calcite and/or greenish smectite	

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		Middle of slide		0.5		Calcite and zeolite (phillipsite?)	Oriented perpendicular to trachytic texture.

COMMENTS : This section was taken to study alteration.

TS# 136 192-1185B-8R-2, 73-76 cm, Piece 8 **Unit 7** **OBSERVER:** **PRC, LMC, CRN, TS, RVW, SPI, MG, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Moderately altered interior of the cooling unit.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic, locally spherulitic; subophitic to intersertal.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	<1	5-8	0.15	0.7	~0.3		Subhedral to euhedral	Some have funaltered interiors.
GROUNDMASS								
Plagioclase	45	45	<0.01	0.06	0.03		Fibrous to acicular and skeletal	Some form varioles with clinopyroxene and possibly olivine.
Clinopyroxene	38	38	<0.01	0.15	0.05		Fibrous to anhedral	Some form varioles with plagioclase and possibly olivine.
Mesostasis	0	7						Partially devitrified.
OPAQUE/ OXIDES MINERALS								
Titanomagnetite	1-2	1-2	<0.01	0.05	0.02		Skeletal to subhedral to euhedral	
Cr spinel	<<1	<<1	<0.01	~0.02			Subhedral to euhedral	Usually inclusions in olivine.
Sulfide	<<1	<<1	<0.01				Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Green smectite	12	0			Olivine and mesostasis	
Fe oxyhydroxide	2-3	0			Olivine and mesostasis	Stains plagioclase and replacement.
Calcite	<1				Olivine, mesostasis, and plagioclase	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
One	<<1				<0.1	Green smectite (nontronite), Fe oxyhydroxide.	

COMMENTS : This sample is also analyzed by ICP-AES. Beautiful texture!!

TS# 138 192-1185B-11R-2, 28-32 cm, Piece 5 — **Unit 9** — **OBSERVER:** **PRC, TS, LMC, CRN, RVW, SPI, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Slightly altered interior of a cooling unit; vein present.**
GRAIN SIZE: **Cryptocrystalline to fine grained.**
TEXTURE: **Variolitic to subspherulitic; locally subtrachytic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	3-7	0.2	0.8	0.5		Subhedral to euhedral	Present also as glomerocrysts. Conspicuous because of alteration.
GROUNDMASS								
Plagioclase	54	55	<0.01	0.1	0.03		Fibrous to skeletal and acicular	Plagioclase forms spherulitic intergrowths with clinopyroxene.
Clinopyroxene	28	32		0.01	<0.01		Elongate to fibrous	
Devitrified glass	0	10						Hard to differentiate from altered olivine.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	~1	~1	<0.01	<0.02	0.01		Skeletal to anhedral	Mainly interstitial.
Cr spinel	<<1	<<1	<0.01	0.03	0.01		Subhedral to euhedral	

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	3	0				Olivine	Mainly stains.
Brown smectite	14	0				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes			0.087	0.25	0.2	Calcite	

COMMENTS : This sample is also analyzed by ICP-AES.

TS# 139 192-1185B-12R-1, 40-44 cm, Piece 6 | **Unit 9** | **OBSERVER:** | **SPI, LMC, CRN, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Moderately altered; veins present.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic to spherulitic; trachytic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	3-7	0.05	0.3	0.2		Euhedral to subhedral	Present also as glomerocrysts.
GROUNDMASS								
Plagioclase	41	42	0.02	0.05	0.03		Elongate	Almost cryptocrystalline; plagioclase forms spherulitic intergrowths with clinopyroxene.
Clinoyroxene	28	30		0.01	<0.01		Fibrous to elongate	Very feathery, almost cryptocrystalline.
Devitrified glass	10	20					Amorphous	
OPAQUE/ OXIDE MINERALS								
Cr spinel	<1	<1	0.01	0.05	0.03		Euhedral	Discrete crystals within olivine phenocrysts.
Titanomagnetite	~1	~1	<0.01	0.02	0.01		Euhedral and skeletal	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	6				Olivine and mesostasis	
Brown smectite	13				Olivine and mesostasis	
Maghemite	Trace				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		throughout	0.2	2		Calcite	Moderately veined. Brown alteration halo is present.

COMMENTS : Very similar to #138. This thin section was taken for the study of alteration.
See **Chapter 5, Figure F52**

TS# 140 192-1185B-14R3, 37-41 cm, Piece 6 **Unit 9** **OBSERVER:** **WJC, TS, SPI, LMC, CRN, MG, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Pillow interior.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Intersertal, subtrachytic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	5-8	0.05	0.75	0.1		Euhedral to subhedral	See comments. Sometimes present as glomerocrysts.
GROUNDMASS								
Plagioclase	40	41	<0.01	0.05	0.01		Skeletal to laths	
Clinopyroxene	34	34	<0.01	0.03	<0.01		Anhedral to skeletal and fibrous	Very feathery, some so fine they are almost cryptocrystalline.
Devitrified glass	0	16						
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	1	1	<0.01	<0.01	<0.01		Skeletal, subhedral to anhedral	Too small to see if maghemitized.
Sulfide	<1	<1		<0.01			Blebs	
Cr spinel	<1	<1	<0.01	0.03	<0.01		Euhedral	Some have titanomagnetite overgrowths.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Fe oxyhydroxide	10				Olivine and mesostasis	More common in the large olivine pseudomorphs.
Brown clay	15				Olivine and mesostasis	
Goethite	<1				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Three			0.02	1	0.5	From wall to center: goethite and calcite.	

COMMENTS : Euhedral-subhedral olivine is present in two different sizes; the larger, which are typically replaced by a combination of Fe oxyhydroxide and brown clay, have plagioclase flowing around them in a subtrachytic texture (see photo #155). The smaller variety is replaced dominantly by the brown clay and both are classified as phenocrysts.
See photomicrograph **1185B-155**

TS# 142 192-1185B-17R-1, 80-82 cm, Piece 4E **Unit 10** **OBSERVER:** **PRC, LMC, CRN, SPI, JH**

ROCK NAME: **Sparsely plagioclase-clinopyroxene-olivine-phyric basalt.**
WHERE SAMPLED: **Highly altered; near a vein/contact with sediment.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic and spherultic; intersertal.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1-2	0.15	0.3	0.2		Subhedral to euhedral	
Plagioclase	2-3	2-3	0.05	0.1	0.08		Euhedral	
Clinopyroxene	1-2	1-2	0.1	0.3	0.2		Subhedral	Foci for variolitic texture.
GROUNDMASS								
Plagioclase	30	31	<0.01	0.1	0.05		Fibrous to skeletal and anhedral	
Clinopyroxene	25	25	<0.01	0.15	0.05		Fibrous and anhedral	Many occur in variolitic texture with plagioclase; a few show subophitic texture.
Devitrified glass	0	37						
OPAQUE MINERALS								
Titanomagnetite	<1	<1		<0.02			Skeletal and anhedral	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	35				Olivine and mesostasis	Olivine is replaced mainly by saponite.
Fe oxyhydroxide	5				Mainly as stain and alteration after olivine and titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes						Smectite and Fe oxyhydroxide	There are some round alteration patches but these are hard to verify as original vesicles because of the altered state of the glass.

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes						From wall to center; Fe oxyhydroxide, calcite, and smectite (saponite)	Sparry calcite crystals are present along the contact with sediment. An alteration halo is present in the basalt at the basalt-sediment contact.

COMMENTS : This section was taken for biostratigraphic dating of the sediment in contact with the basalt.

TS# 143 192-1185B-17R-1, 94-98 cm, Piece 7 — **Unit 10** — **OBSERVER:** **CRN. LMC**

ROCK NAME: **Sparsely olivine-clinopyroxene-phyric basalt.**
WHERE SAMPLED:
GRAIN SIZE: **Microcrystalline.**
TEXTURE: **Variolitic to subtrachytic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	**0**	**1-2**	**0.2**	**0.5**	**0.3**		Euhedral to subhedral	
Plagioclase	**<1**	**<1**	**0.2**	**0.4**	**0.3**		Subhedral and tabular	
Clinopyroxene	**1**	**1**	**0.2**	**0.6**	**0.3**		Subhedral	
GROUNDMASS								
Plagioclase	**50**	**50**	**<0.01**	**0.1**	**0.1**		Skeletal laths	
Clinopyroxene	**35**	**35**			**<0.01**		Feathery	
Glass	**0**	**12**					Interstitial	
OPAQUE MINERALS								
Sulfide	**Trace**	**Trace**			**<0.01**		Blebs	In glass.
Titanomagnetite	**<1**	**<1**			**<0.01**		Skeletal	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Green smectite	**2**				Olivine and glass	
Brown smectite	**6**				Glass	
Fe oxyhydroxide	**4**				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes		Middle of slide	0.1	0.5		Fe oxyhydroxide and calcite	

COMMENTS : This this section was taken to study alteration.

TS# 144 192-1185B-17R-3, 1-3 cm, Piece 1A **Unit 10** **OBSERVER:** **MG, LMC, SPI, RVW, CRN, MG, JH**

ROCK NAME: **Moderately olivine-plagioclase-phyric basalt.**
WHERE SAMPLED: **Relatively ''coarse grained massive section.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Subophitic to intersertal; subvariolitic in places.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1-3	0.6	0.8	0.6		Euhedral to subhedral	Also present as glomerocrysts; irregularly distributed.
Plagioclase	1	1	0.6	0.7	0.6		Euhedral	Present as glomerocrysts with olivine; resorbed along grain boundaries. Some with oscillatory zoning present.
Clinopyroxene	<1	<1	0.1	0.2	0.2		Euhedral, equant	
GROUNDMASS								
Clinopyroxene	41	42	0.2	0.6	0.4		Subhedral to anhedral	Subophitic texture with plagioclase.
Plagioclase	40	40	0.06	0.24	0.1		Elongate to tabular	Tabular grains are mostly subhedral to anhedral.
Mesostasis	0	10						
OPAQUE MINERALS								
Titanomagnetite	3	3	0.06	0.14	0.1		Subhedral to anhedral and some skeletal	Mainly associated with pseudomorphs after olivine and mesostasis.
Sulfide	Trace	Trace			<0.01		Blebs	In plagioclase and mesostasis; pentlandite.

SECONDARY MINERALOGY	PERCENT		SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	15	0				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS :

See **Chapter 5, Figure F58**; see photomicrographs **1185B-158**, **1185B-187**, **1185B-188**

TS# 145 192-1185B-17R-3, 96-98 cm, Piece 7 **Unit 10** **OBSERVER:** **PRC, LMC, CRN, SPI, RVW, TS, MG, JH**

ROCK NAME: **Moderately plagioclase-olivine-clinopyroxene-phyric basalt.**

WHERE SAMPLED: **Typical fine grained basalt.**

GRAIN SIZE: **Cryptocrystalline to microcrystalline.**

TEXTURE: **Glomerophyric (plagioclase and olivine) in a spherulitic groundmass.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	3	3	0.07	0.12	0.1		Subhedral elongated laths to anhedral and tabular	Many crystals have swallow-tail ends; some have cryptocrystalline boundaries; also present as glomerocrysts.
Clinopyroxene	1	1	0.05	0.12	0.1		Subhedral	Some crystals show sector zoning.
Olivine	0	2	0.05	0.2	0.15		Subhedral to euhedral	
GROUNDMASS								
Plagioclase	5	5	<0.01	0.03	0.01		Skeletal and acicular	Many crystals are isolated, but are also present in patches; subophitic intergrowth with clinopyroxene.
Clinopyroxene	1	2		<.0.05			Anhedral	
Olivine	<1	1		<.0.05			Anhedral to elongate	
Devitrified glass	71	86						
OPAQUE MINERALS								
Titanomagnetite	1	1		<0.01			Skeletal to anhedral	Mainly interstitial in the mesostasis.
Cr spinel	Trace	Trace						

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	17				Olivine and mesostasis	Brown smectite is probably saponite. Green smectite (nontronite?) is also present.
Celadonite	Trace				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
One						Brown smectite	

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : This sample is also analyzed by ICP-AES. The section shows a typical quenched texture near the margin of a cooling unit. There is an alteration halo around most of the section, but it does not appear to have an obvious effect on the texture and mineralogy of the sample. Groundmass is just developing in this section.

See photomicrographs **1185B-175**, **1185B-178**

TS# 146 192-1185B-18R2, 17-20 cm, Piece 3 — **Unit 10** — **OBSERVER:** **WJC, LMC, CRN, SPI, RVW, MG, JH**

ROCK NAME: **Sparsely olivine-plagioclase-clinopyroxene-phyric basalt.**
WHERE SAMPLED: **Typical fine grained basalt.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Variolitic, intersertal.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1-2	0.07	0.32	0.1		Subhedral to euhedral	
Plagioclase	1-2	1-2	0.1	0.3	0.15		Subhedral to euhedral	Some oscillatory zoning present.
Clinopyroxene	1	1	0.05	0.2	0.8		Subhedral	
GROUNDMASS								
Plagioclase	40	40	<0.01	0.05	0.01		Skeletal, laths	
Clinopyroxene	25	25	<0.01	0.1	0.01		Anhedral	
Devitrified glass	18	38						Possibly contains cryptocrystalline plagioclase, clinopyroxene.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	2	2	<0.01	0.04	<0.01		Skeletal, anhedral, cruciform	Very slightly maghemitized.
Sulfides	<1	<1	<0.01	<0.01	<0.01		Blebs	As inclusions, ubiquitous. Some may be pentlandite.
Cr spinel	<<1	<<1	<0.01	0.02	<0.01		Euhedral	Associated with olivine.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	12				Olivine and glass	
Calcite	<<1				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : Contains a coaser-grained patch of olivine, plagioclase and clinopyroxene.
See **Chapter 5, Figure F41**; see photomicrographs **1185B-159**, **1185B-189**

TS# 147 192-1185B-20R-1, 6-9 cm, Piece 2 **Unit 11** **OBSERVER:** **WJC, RVW, LMC, CRN, TS, MG, SPI, JH**

ROCK NAME: **Sparsely plagioclase-olivine-clinopyroxene-phyric basalt.**

WHERE SAMPLED: **Near top of Unit 11.**

GRAIN SIZE: **Fine grained.**

TEXTURE: **Subophitic; coarser-grained patches present.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1	0.08	0.4	0.15		Euhedral to subhedral	
Plagioclase	2	2	0.1	0.2	0.15		Euhedral to subhedral	Some show oscillatory zoning.
Clinopyroxene	1	1	0.05	0.2	0.1		Subhedral, equant	
COARSER-GRAINED PATCHES								
Plagioclase	6	6	0.04	0.18	0.1		Tabular, laths, subhedral	Some have oscillatory zoning.
Clinopyroxene	4	4	0.08	0.34	0.15		Anhedral	
Olivine phenocrysts	0	1	0.08	0.4	0.15		Euhedral to subhedral	
GROUNDMASS								
Plagioclase	42	42	<0.01	0.04	0.02		Skeletal, laths	
Clinopyroxene	37	37	0.01	0.08	0.04		Anhedral	Bowties, and subophitic texture with plagioclase.
Mesostasis	0	2						
OPAQUE MINERALS								
Titanomagnetite	2	2	<0.01	0.04	<0.02		Skeletal, anhedral	No good for PGE's.
Chalcopyrite?	<<1	<<1	<0.01	<0.01	<0.01		Irregular	Associated with vein.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	3				Olivine and mesostasis	
Green smectite	1				Mesostasis	
Celadonite	<1				Olivine	
Calcite	<1				Olivine	
Hematite	1	0.01	0.15	0.05	Associated with vein	Tabular, laths; maghemitized.
Pyrite	1	<0.01	0.05	0.02	Irregular to subhedral	Associated with alteration halo.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Three		Near base of slide	0.4	2.5		Calcite, celadonite, brown smectite, Fe oxyhydroxide, nontronite, green smectite, hematite	

COMMENTS : Isolated patches of coarse-grained plagioclase, clinopyroxene, and pseudomorphs after olivine (1%) are common. These patches may be smaller versions of the coarsely-crystalline clusters seen in hand sample in Section 22R-6. They probably occur when a relatively quickly cooled lava entrained pieces of nearly crystallized lava that cooled more slowly. Phenocrysts are described as discrete, euhedral crystals that are not within the coarser-grained patches.

See photomicrographs **1185B-163**, **1185B-171**

TS# 148 192-1185B-20R-1, 27-29 cm, Piece 4 — **Unit 11** — **OBSERVER:** **PRC, SPI, LMC, MG, JH**

ROCK NAME: **Aphyric basalt.**
WHERE SAMPLED: **Vesicular top of Unit 11.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Intergranular to subophitic; intersertal; locally variolitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	<1	<1	0.45	0.6	0.5		Anhedral to subhedral	Mainly stubby to tabular and with irregular boundaries.
GROUNDMASS								
Plagioclase	40	45	0.06	0.3	0.18		Anhedral to subhedral and elongate	
Clinopyroxene	35	35	0.05	0.4	0.2		Euhedral to anhedral	Show twinning and sector zoning. Some euhedral equant crystals could be phenocrysts.
Devitrified glass	0	20						Presently cavities (see comment below); a few could be olivine.
OPAQUE MINERALS								
Titanomagnetite	<1	<1		<0.07			Anhedral	Porous looking and partly altered to maghemite.
Maghemite	Trace	0		<0.01			Anhedral	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Calcite	3	0			Cavities, plagioclase and glass	
Brown smectite	1	0			Cavities, plagioclase and glass	
Celadonite	<1	0			Cavities, plagioclase and glass	
Geothite	1	0			Cavities	Sometimes forms as layering on cavity walls and sometimes filling the cavities.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes	18						See comment below.

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : This section was taken to investigate thealteration and vesicular nature of the sample. The apparent vesicles, some of which are filled with sparry calcite +/- celadonite and red goethite while others are partially layered with smectite and goethite, have very irregular and/or angular boundaries. This morphology suggests these are miarolitic cavities and possibly some open spaces left behind by secondary dissolution of calcite that replaced olivine.

See **Chapter 5, Figure F59**, **Figure F60**; see photomicrographs **1185B-184**, **1185B-190**, **1185B-191**, **1185B-219**

TS# 149 192-1185B-20R-3, 66-68 cm, Piece 3B **Unit 11** **OBSERVER:** **RVW, PRC, LMC, CRN, SPI, TS, JH**

ROCK NAME: **Sparsely plagioclase-olivine-phyric basalt.**
WHERE SAMPLED: **Interior of massive flow; coarser-grained patches present.**
GRAIN SIZE: **Fine grained; holocrystalline.**
TEXTURE: **Subophitic; locally variolitic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1	<0.1	0.6	0.2		Subhedral to euhedral	Present as isolated crystals or in glomerocrysts.
Plagioclase	2	2	0.1	0.3	0.15		Euhedral	
Clinopyroxene	<1	<1	0.05	0.2	0.1		Subhedral, equant	
COARSER-GRAINED PATCHES								
Olivine	0	2	<0.1	0.6	0.2		Subhedral to euhedral	
Plagioclase	3	3	~0.05	0.3	0.1		Subhedral laths	Oscillatory zoning present; some contain glass inclusions.
Clinopyroxene	2	2	~0.1	0.3	0.2		Subhedral to anhedral	May have simple twinning; subophitically encloses plagioclase.
GROUNDMASS								
Plagioclase	45	45	<0.01	0.05	0.02		Subhedral laths	Laths are generally more elongate than those in the coarser-grained regions.
Clinopyroxene	40	40	<0.01	0.1	0.05		Andedral to subhedral	
Mesostasis	0	4-Jan						Brown cryptocrystalline material; fine plagioclase varioles protrude into mesostasis-rich regions.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	2	2	<0.01	0.015	0.01		Skeletal to anhedral	Concentrated in mesostasis.
Cr spinel	Trace	Trace			<0.01		Subhedral	Ragged inclusions in altered olivine.
Sulfide	Trace	Trace			<0.01		Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	6				Olivine and mesostasis	
Fe oxyhydroxide	<1				Mesostasis	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : Within this predominantly fine-grained rock, coarser-grained patches up to 2 mm in size are present. They contain olivine + plagioclase, olivine + plagioclase + clinopyroxene and plagioclase + clinopyroxene, and do not have sharp boundaries with the host basalt. These clusters are interpreted as inclusions of a more slowly-cooled basaltic magma, probably entrained from an earlier pulse within the same inflated flow unit.

See **Chapter 5, Figure F35**, **Figure F28**; see photomicrographs **1185B-161**, **1185B-162**

TS# 151 192-1185B-22R5, 107-110 cm, Piece 3E — **Unit 11** — **OBSERVER:** **MG, LMC, CRN, SPI, TS, JH**

ROCK NAME: **Sparsely plagioclase-olivine-phyric basalt.**
WHERE SAMPLED: **Contact between fine-grained and aphanitic layers.**
GRAIN SIZE: **Fine grained.**
TEXTURE: **Intersertal to intergranular.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Plagioclase	1	1	0.05	0.1	0.08		Euhedral	
Olivine	0	1	0.1	0.6	0.3		Subhedral to euhedral	Altered; present mainly as glomerocrysts in the coarser-grained area; some isolated grains in the aphanitic areas.
COARSER-GRAINED PATCHES								
Plagioclase	3	3	0.06	0.2	0.15		Subhedral laths	Large plagioclases form coarser-grained patches 'filled' with glass. Plagioclase clusters are also disaggregated. Some crystals with oscillatory zoning are present.
Clinopyroxene	<<1	<<1	0.2	0.6	0.3		Subhedral to anhedral	One grain observed close to one of the large plagioclase clusters.
GROUNDMASS								
Plagioclase	45	45	0.01	0.03	0.03		Elongated, tabular	Plagioclase and clinopyroxene in bowtie texture.
Clinopyroxene	40	43	0.07	0.1	0.08		Subhedral	
Mesostasis	0	6					Interstitial	
OPAQUE MINERALS								
Titanomagnetite	1	1	0.01	0.07	0.04		Anhedral, skeletal	Observed mainly close to pseudomorphs after olivine or in altered glass.
Sulfide	<1	<1	<0.01	0.01	0.02		Blebs, anhedral	Pentlandite; inclusions in silicates or interstitial.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown and green smectite	10	0			Olivine, glass, and clinopyroxene	Often plucked out.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.		
Yes				0.02		Brown smectite	

COMMENTS : The transition from aphanitic to fine-grained texture is gradual; large plagioclase crystals occur throughout the section. In addition to plagioclase, these coarser-grained patches contain clinopyroxene, titanomagnetite, olivine and mesostasis. They have a intersertal to subophitic texture.

TS# 152 192-1185A-22R-6, 51-54 cm, Piece 6A **Unit 11** **OBSERVER:** **WJC, SPI, CRN, LMC, MG, JH**

ROCK NAME: **Sparsely plagioclase-olivine-phyric basalt with coarser-grained patches.**

WHERE SAMPLED: **Aphanitic basalt near textural change.**

GRAIN SIZE: **Fine grained.**

TEXTURE: **Heterogeneous: intergranular, variolitic (fine grained), subophitic, subtrachytic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	1	0.06	0.34	0.15		Euhedral; glomerocrysts	
Plagioclase	2	2	0.05	0.2	0.15		Euhedral	
COARSER-GRAINED PATCHES								
Olivine	0	1	0.06	0.34	0.15		Euhedral; glomerocrysts	
Plagioclase	11	11	0.02	0.14	0.08		Subhedral laths	Occasionally as isolated, resorbed crystals.
Clinopyroxene	8	8	0.05	0.34	0.15		Anhedral	Subophitically encloses plagioclase.
GROUNDMASS								
Plagioclase	34	34	<0.01	0.04	<0.01		Subhedral laths	
Clinopyroxene	30	30	<0.01	0.05	<0.02		Anhedral	Bowtie structure with plagioclase.
Devitrified glass	4	10						
OPAQUE MINERALS								
Titanomagnetite	3	3	<0.01	0.04	0.01		Skeletal, subhedral to anhedral; irregular	
Sulfide	Trace	Trace	<0.01	0.7	<0.01			As inclusions in glass and plagioclase; pyrrhotite?
Chalcopyrite	Trace	Trace			<0.01			As inclusions in mesostasis.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown smectite	8				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Three						Brown smectite and calcite	

COMMENTS : This section transects coarser-grained patches of minerals also found in the groundmass. It is presumed that these patches represent liquid cooled more slowly and therefore are still representative of the same cooling unit. Outside of these patches, rare, isolated phenocrysts of plagioclase are resorbed along the edges; olivine phenocrysts are also present. Fine-grained regions = porphyritic; subvariolitic to intergranular. Coarser-grained patches = variolitic to subophitic and subtrachytic.

See **Chapter 5, Figure F42**; see photomicrograph **1185B-165**

TS# 153 192-1185B-22R-7, 42-43 cm, Piece 2 **Unit 12** **OBSERVER:** **PRC, LMC, CRN, SPI, MG, JH**

ROCK NAME: **Moderately plagioclase-olivine-clinopyroxene-phyric basalt.**

WHERE SAMPLED: **Top of Unit 12.**

GRAIN SIZE: **Microcrystalline to fine grained.**

TEXTURE: **Spherulitc and trachytic; porphyritic with holocrystalline variolitic and subophitic patches.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	2-3	0.05	0.2	0.1		Subhedral to anhedral	Some are glomerocrysts.
Plagioclase	3	3	0.08	0.15	0.1		Euhedral	
Clinopyroxene	2	2	0.05	0.1	0.1		Subhedral	Foci for variolites.
COARSER-GRAINED PATCHES								
Plagioclase	~1	~1	0.07	0.16	0.1		Anhedral tabular to subhedral acicular	These have irregular boundaries (see comments); present as isolated crystals.
Clinopyroxene	Trace	Trace	0.06	0.16	0.1		Anhedral	Present as isolated crystals.
GROUNDMASS								
Plagioclase	40	40	<0.01	0.06	0.02		Microcrystalline to skeletal and acicular	Some are in feathery intergrowth with clinopyroxene.
Clinopyroxene	28	28	<0.01	0.15	0.03		Feathery to anhedral	A few clinopyroxene bowtied to plagioclase are present.
Devitrified glass	15	21						
OPAQUE MINERALS								
Titanomagnetite	~2	~2	<0.01	0.04	0.01		Skeletal to anhedral and subhedral	The largest crystals are within the patches.
Sulfide	Trace	Trace			<0.01		Blebs	Inclusions in silicates and glass.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Smectite	8				Olivine and glass	
Celadonite	1				Olivine and glass	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes				0.04		Celadonite	Hairline (<1 mm) thin along most sections and branching; present in the lower left corner of the section.

COMMENTS : This sample is also analyzed by ICP-AES. Although plagioclase and clinopyroxene are listed as phenocrysts, these could be disaggregated crystals from coarser-grained patches.
See **Chapter 5, Figure F30**, **Figure F56**; see photomicrograps **1185B-166**, **1185B-167**, **1185B-168**, **1185B-186**, **1185B-211**

TS# 154 192-1185B-28R-1, 80-82 cm, Piece 3B **Unit 12** **OBSERVER:** **PRC, LMC, CRN, SPI, MG, JH**

ROCK NAME: **Moderately olivine-plagioclase phyric basalt.**

WHERE SAMPLED: **Bottom of fine-grained Unit 12.**

GRAIN SIZE: **Fine grained.**

TEXTURE: **Subophitic to intergranular; porphyritic and with patches of intersertal aggregates and a few variolites.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	3	0.06	0.25	0.1		Subhedral to euhedral	The largest olivine pseudomorphs are only slightly (1.5 X) larger than the largest clinopyroxene crystals in the groundmass. Some are glomerocrysts.
Plagioclase	1-2	1-2	0.2	0.6	0.4		Anhedral tabular to acicular	Have very irregular boundaries; some contain devitrified glass inclusions.
GROUNDMASS								
Plagioclase	40	40	0.03	0.12	0.08		Anhedral to subhedral and acicular	Plagioclase in the variolitic patches is feathery.
Clinopyroxene	49	49	0.03	0.18	0.1		Anhedral to subhedral	Clinopyroxene in the variolitic patches is feathery.
Mesostasis	0	4						
OPAQUE MINERALS								
Titanomagnetite	2	2	<0.1	0.07	0.08		Skeletal to anhedral and subhedral	Mainly in the intersertal patches where they can be 4 mm long.
Sulfide	<<1	<<1		0.01			Anhedral to irregular blebs	Inclusions in silicates and oxides (pentlandite).

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown to green smectite	7				Olivine, mesostasis, and plagioclase	Mostly brown smectite.
Maghemite	Trace		<.01		Anhedral blebs	Exsolving from titanomagnetite; probably alteration along partings.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
None							

COMMENTS : This sample is also analyzed by ICP-AES.

TS# 155 192-1185B-5R-3, 32-34 cm, Piece 1A **Unit 2** **OBSERVER:** **PRC, SPI, LMC, TS, JH**

ROCK NAME: **Moderately olivine-phyric basalt.**
WHERE SAMPLED: **Moderately altered.**
GRAIN SIZE: **Holocrystalline; fine grained.**
TEXTURE: **Variolitic to intergranular; porphyritic.**

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	APPROX. COMP.	MORPHOLOGY	COMMENTS
PHENOCRYSTS								
Olivine	0	6	0.07	0.22	0.15		Subhedral to euhedral	Most are smaller than some of the groundmass clinopyroxene.
GROUNDMASS								
Clinopyroxene	48	48	<0.01	0.12	0.05		Feathery microlites to anhedral	Interstitial between larger groundmass plagioclase.
Plagioclase	37	41	0.01	0.2	0.1		Skeletal and acicular to anhedral and elongate	
Mesostasis	0	3						Altered interstitial glass and cryptocrystallites.
OPAQUE/ OXIDE MINERALS								
Titanomagnetite	1-2	1-2	<0.01	0.1	0.03		Skeletal to anhedral to subhedral	Mainly interstitial.
Cr spinel	Trace	Trace		<0.03			Euhedral	Brown and with high relief; associated with altered olivine.
Sulfide	Trace	Trace		<0.01			Blebs	

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Green and brown smectite	11				Olivine, plagioclase and mesostasis	
Celadonite	Trace				Olivine	
Fe oxyhydroxide	2				Olivine, mesostasis	
Calcite	Trace				Olivine	Percentage does not include vein.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
One						Celadonite	

VEINS	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Yes			2.4	2.8		Calcite and Fe oxyhydroxide	Calcite is in sparry and micritic forms. There is an alteration halo on either side of the vein and it is marked by moderate to high Fe oxyhydroxide stains/replacement.

COMMENTS :

See **Chapter 5, Figure F66**; see photomicrograph **1185B-193**