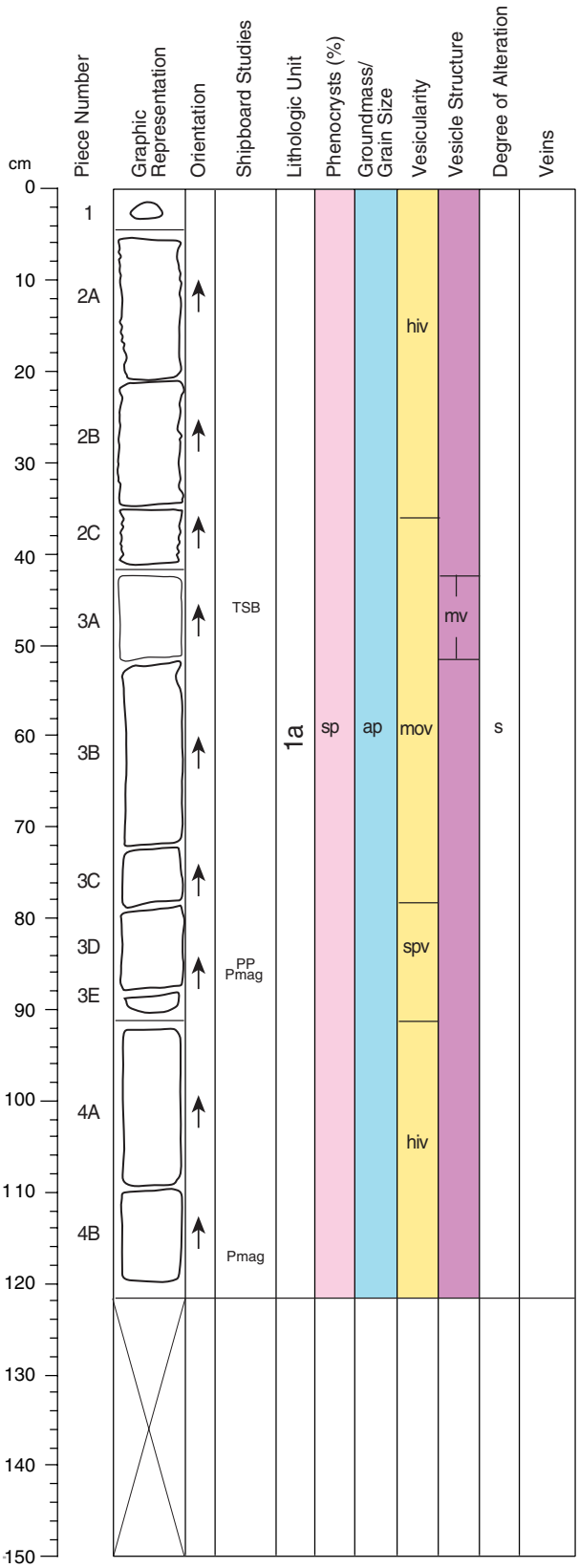
Core Photo

1206A-1W WASH CORE



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-2R-1 (Section top: 57.0 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None observed. The contact of Unit 1 with overlying limestone is inferred to be between Pieces 1 and 2.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	1.5	0.5	1	Euhedral

GROUNDMASS: Aphanitic. Contains plagioclase, clinopyroxene, black oxides, green mesostasis and possibly olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
4-34 cm	25-30	3	Round to irregular
34-43 cm	19	5	Irregular
52-78 cm	5	6	Round to irregular
78-94 cm	3	5	Round to irregular
94-150 cm	30	2	Round

COLOR: Medium light gray (N6).

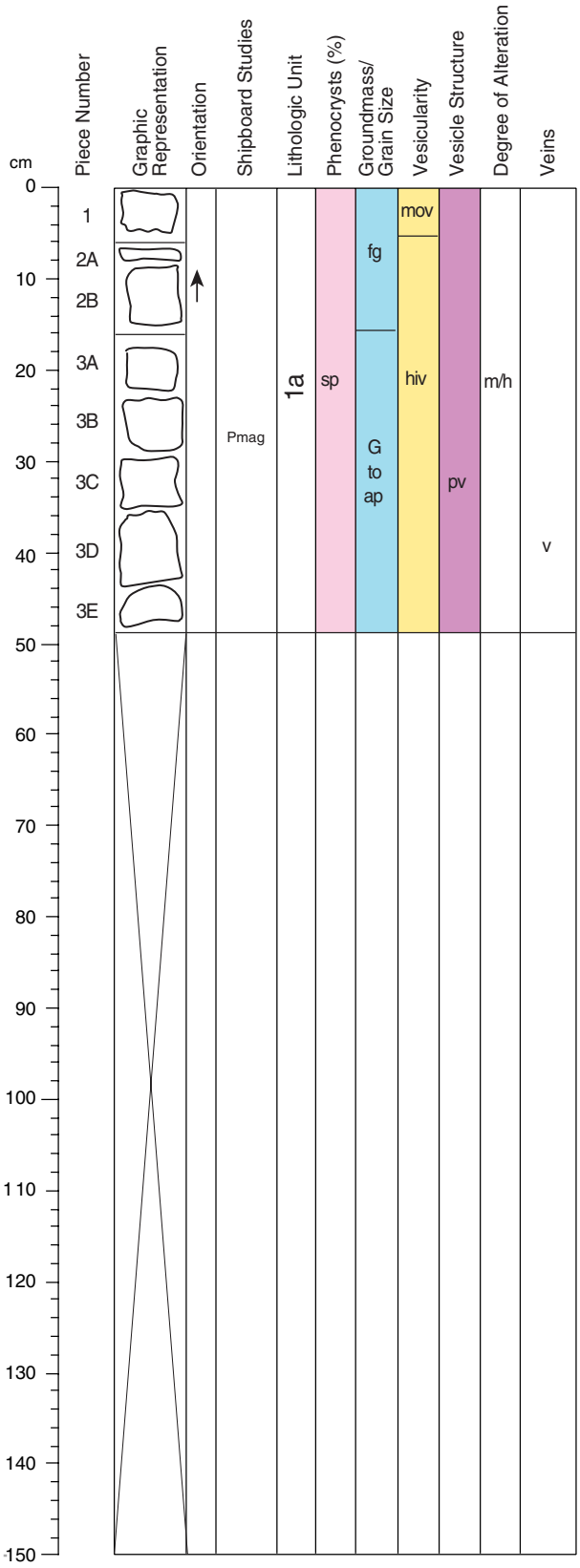
STRUCTURE: Lobed.

ALTERATION: Slight. Vesicles are filled with green clay, calcite or fibrous tan material. Pyrite is abundant near the sharp contact of the megavesicle and the surrounding basalt in Piece 3A.

VEINS/FRACTURES: None.

COMMENTS: A megavesicle spans the width of the core from 43 to 52 cm. The top boundary of the vesicle is not preserved. It is filled with fossiliferous limestone (coarse beach deposit) with a sharp basal contact. At the base of the vesicle, a <1 mm band of segregated material is present in the basalt.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-2R-2 (Section top: 58.23 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	2	0.5	1.5	Euhedral

GROUNDMASS: Fine grained to aphanitic near lobe margins. Contains plagioclase, clinopyroxene, black oxides, green mesostasis and olivine (possibly microphenocrysts).

VESICLES:	% Mode	Size (mm): Average	Shape
0-6 cm	10	1	Round
6-41 cm	20	1	Round to irregular

COLOR: Medium gray (N5) to brownish gray (5YR 4/1).

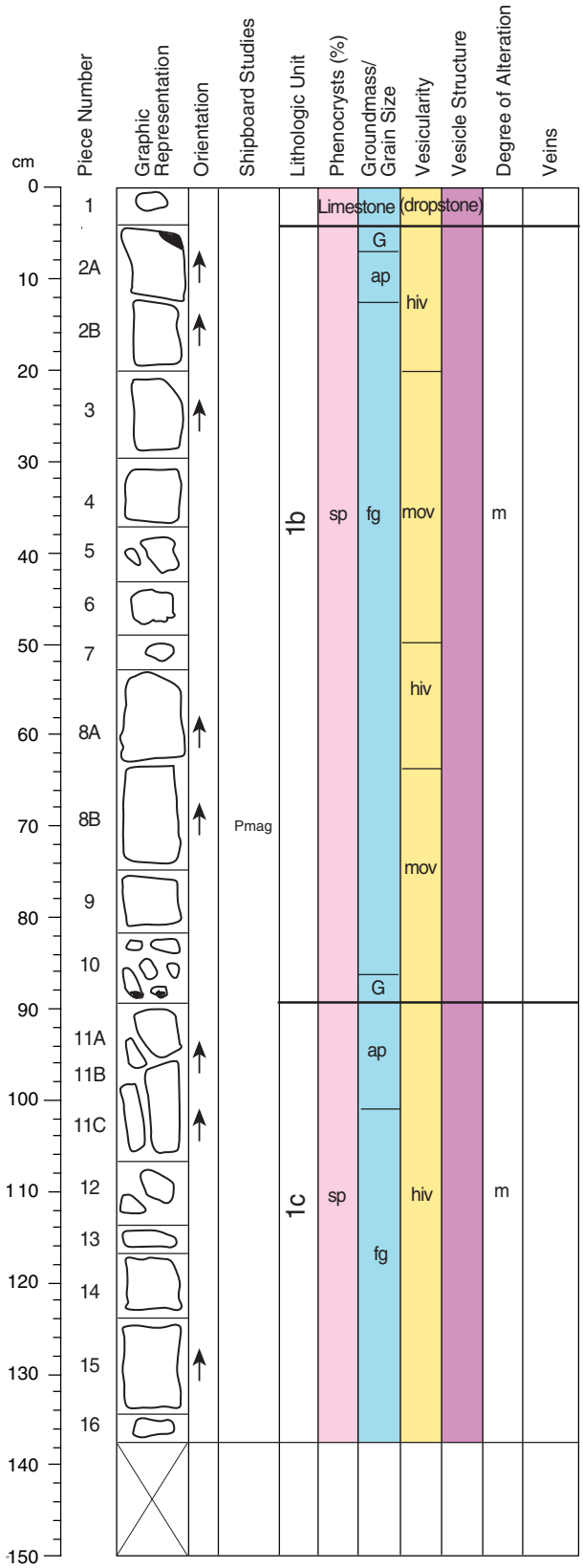
STRUCTURE: Lobed.

ALTERATION: Moderate to high. Vesicles are commonly filled with green clay, calcite, Fe oxyhydroxide, or sediment. Sulfide is present near vesicle fill in Piece 3A.

VEINS/FRACTURES: Sparsely veined. A <1 mm vein is present in Piece 3D and filled with gray clay.

COMMENTS: Unaltered glass is present at lobe margins in Pieces 3A-3E. Green sediment has filled vesicles near lobe margins. Detrital sediment containing coarse sand and shell fragments fills a 1 cm vesicle in Piece 3A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-1 (Section top: 58.5 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	1	0.5	0.75	Euhedral

GROUNDMASS: Fine grained to aphanitic near lobe margins. Contains plagioclase, clinopyroxene, black oxide, green mesostasis and variably altered olivine. A subophitic texture is visible, with plagioclase laths being enclosed by oikocrystic clinopyroxene.

VESICLES:

% Mode	Size (mm): Average	Shape
10-30	3	Round

COLOR: Medium gray (2.5Y 4/0).

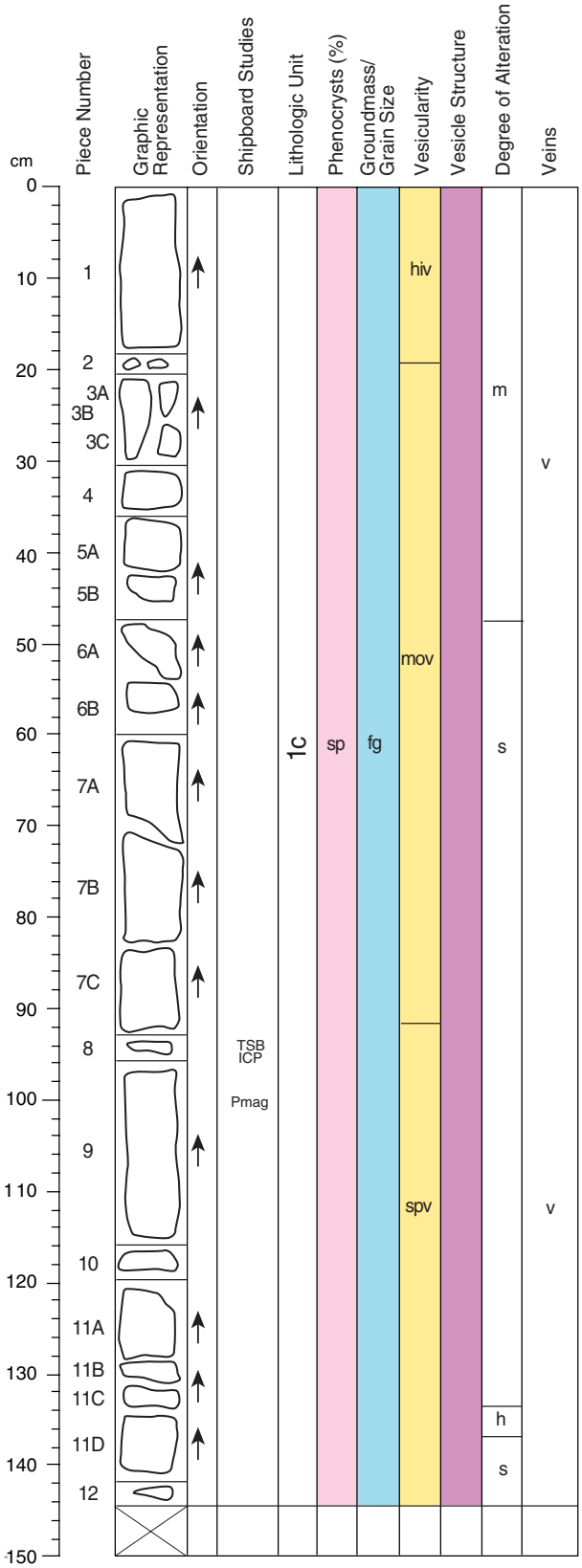
STRUCTURE: Lobed. Lobe margins are present between Pieces 1 and 2 and between Pieces 9 and 10, and are defined by the presence of altered glass.

ALTERATION: Moderate. Vesicles are either unfilled, or filled with green clay, orange/yellow or blue/gray material, or white carbonate. Olivine phenocrysts are altered to Fe oxyhydroxide. Groundmass olivine is variably altered to Fe oxyhydroxide. Glass is completely altered to green material.

VEINS/FRACTURES: None present.

COMMENTS: Piece 1 is fossiliferous limestone and is probably a dropstone.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-2 (Section top: 59.9 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	2	1	0.5	0.75	Euhedral

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene, black oxides, green mesostasis and altered olivine (may be a microphenocryst phase).

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
	2-21	8	Round to irregular

COLOR: Medium gray (2.5Y 4/0).

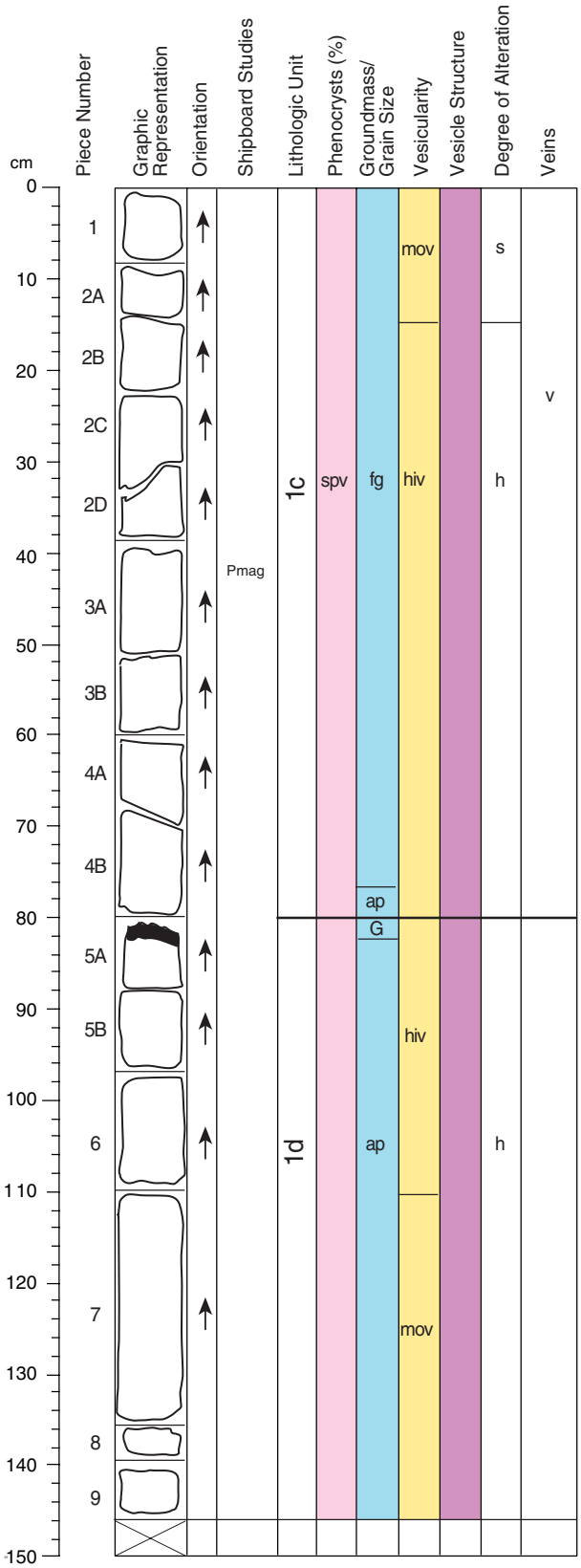
STRUCTURE: Lobed. Based on the presence of glassy lobe margins in 3R-1.

ALTERATION: Slight to high. Vesicles are either unfilled, or filled with green clay (that expands when wet), white carbonate, orange/yellow material or blue-green powdery clay (celadonite). Olivine phenocrysts are altered to Fe oxyhydroxide on the outside and green clay on the inside. A Fe oxyhydroxide stain is present at 134 cm.

VEINS/FRACTURES: Thin (2-3 mm) carbonate and Fe oxyhydroxide filled veins are present at 31 cm and 112 cm.

COMMENTS: The unit is highly vesicular (21%) from 0-18 cm, moderately vesicular (~10%) from 18-92 cm, and sparsely vesicular (2%-3%) from 93-146 cm. We interpret it as representing the transition from the upper crust to the massive interior of a pahoeoe lobe.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-3 (Section top: 61.35 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	1-4	1	0.5	0.75	Euhedral

GROUNDMASS: Fine grained to aphanitic. Contains plagioclase, clinopyroxene, black oxides, green mesostasis and altered olivine (may be a microphenocryst phase).

VESICLES:

%	Size (mm):	
Mode	Average	Shape
5-40	6	Round to irregular

COLOR: Medium dark gray (N/4) in unaltered areas. Light gray (N7) with Fe oxyhydroxide moderate brown (5YR 4/4) in altered areas. Lower in the section the color is light brownish gray (5YR 6/1).

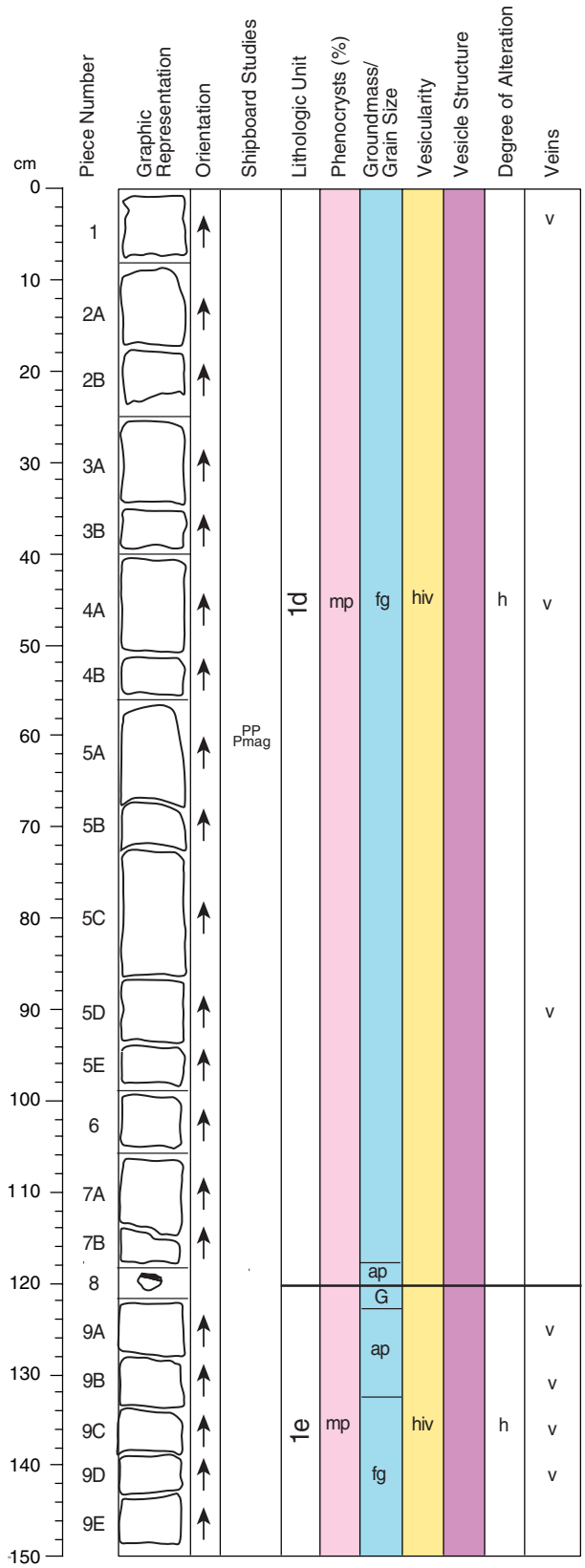
STRUCTURE: Lobed. Based on the presence of glassy lobe margin in Piece 5A.

ALTERATION: Slight to high. Vesicles have a variety of fillings. Green clays and small amounts of blue/green clays (celadonite) fill vesicles in the first 10 cm. There is a transition between gray and orange/brown clay at 10 cm. Within the orange/brown zone, vesicles are mostly filled with orange/brown clay, small amounts of green clay (saponite/nontronite) and carbonate. Olivine phenocrysts are altered to Fe oxyhydroxide on the outside and green clay on the inside.

VEINS/FRACTURES: Sparsely veined. A thin (2-3 mm) Fe oxyhydroxide filled vein is present at 22-25 cm.

COMMENTS: The unit is moderately vesicular (5%) from 1-11 cm, highly vesicular (25%-40%) from 11 to 110 cm, and moderately vesicular (14%) from 110 to 147 cm. The highest concentration of vesicles (~40%) occurs at the bottom of a lobe at 80 cm. Space at the lobe contact is filled with detrital calcareous sediment.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-4 (Section top: 62.83 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-5	3	0.5	0.75	Euhedral

GROUNDMASS: Fine grained. Aphanitic and glassy near lobe margin. The groundmass contains plagioclase, clinopyroxene, black oxide and variably altered olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
0-24 cm	50	5	Round to irregular
24-68 cm	30	5	Round to irregular
68-99 cm	50	3	Round to irregular
99-115 cm	50	2	Round to irregular
115-128 cm	50	1	Round to irregular
128-150 cm	50	2	Round to irregular

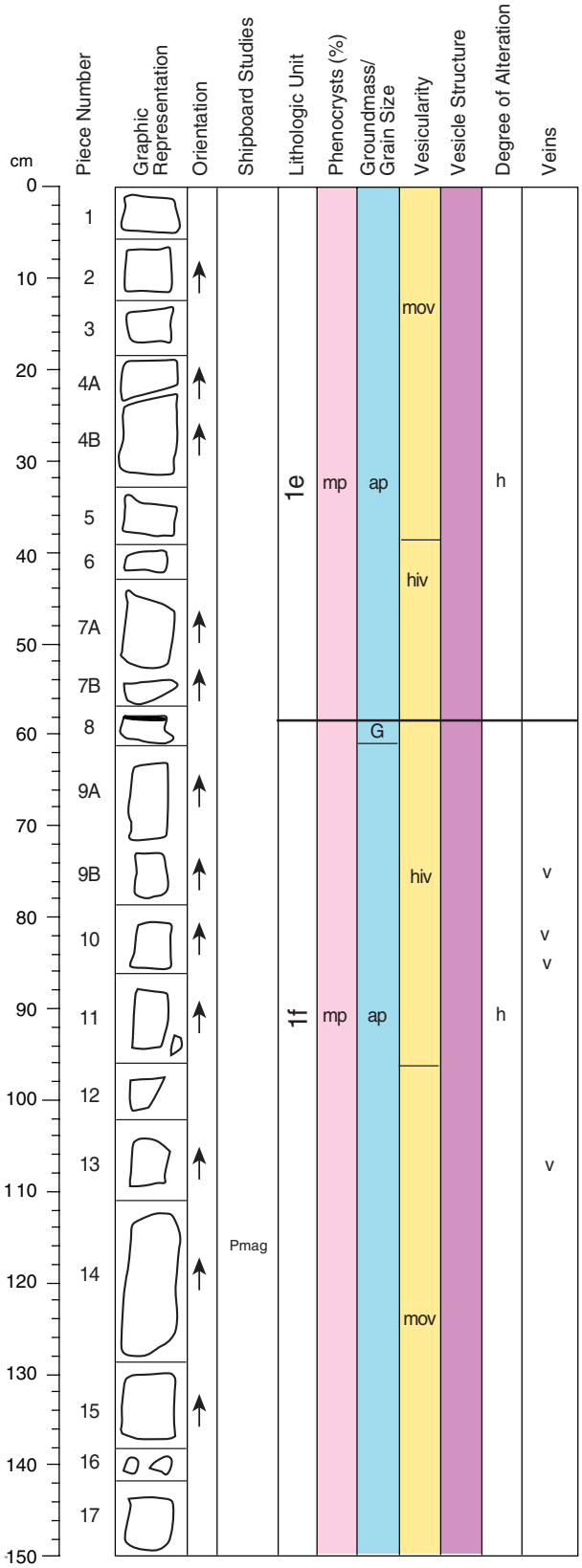
COLOR: Pale yellowish brown (10 YR 6/2).

STRUCTURE: Lobed. Lobe margin is present in Piece 8 at 120 cm, and defined by the presence of altered glass, change in crystallinity and vesicularity.

ALTERATION: High. Glass near lobe margin is altered to brown clay and Fe oxyhydroxide. Olivine phenocrysts and most groundmass olivine are altered to Fe oxyhydroxide. Vesicles are either unfilled, or filled with orange/yellow/green clay, carbonate and Fe oxyhydroxide. Some well shaped calcite crystals are present in Piece 9A.

VEINS/FRACTURES: Sparsely veined. ~1 mm wide, randomly oriented veins are present in Pieces 1, 4A, 5D and 9A-9D, and filled with carbonate and Fe oxyhydroxide.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-5 (Section top: 64.33 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-17

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2-3	2	1	1.5	Euhedral to subhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxide and perhaps altered olivine. Piece 8 is part of a lobe margin, and the groundmass crystallinity decreases from Piece 7A to 7B to 8.

VESICLES:	% Mode	Size (mm): Average	Shape
0-38 cm and 96-150 cm	20	3	Elongated
38-96 cm	30	1	Oval

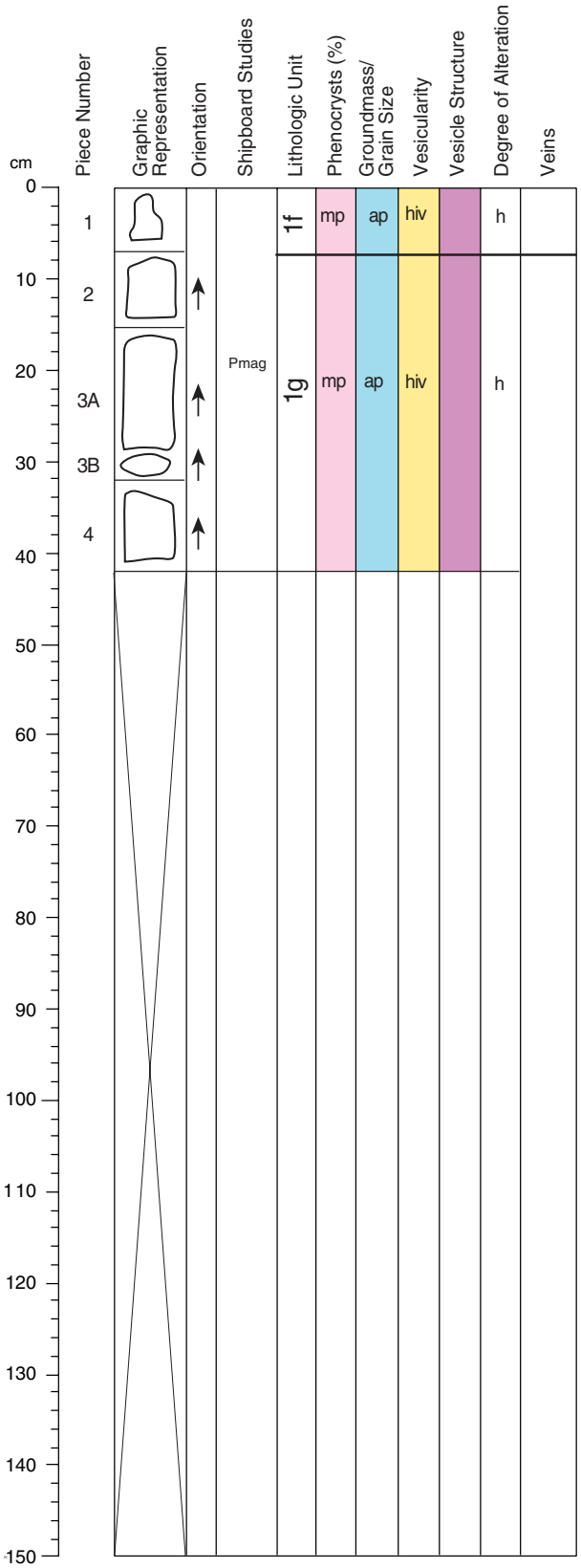
COLOR: Light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Lobe margin is present in Piece 8 at 58 cm, and defined by the presence of an altered glassy lobe margin (i.e., a smooth pahoehoe surface).

ALTERATION: High. Olivine phenocrysts and possibly groundmass olivine are completely altered to Fe oxyhydroxide. Some altered phenocrysts have the morphology of plagioclase, but a positive identification is not possible. Vesicles are dominantly filled with dark yellowish orange (10YR 6/1) clay, carbonate, very pale green (saponite/nontronite) and blue green (celadonite) clays. Some vesicles filled with celadonite are lined by carbonates.

VEINS/FRACTURES: Sparsely veined. <1 mm wide, carbonate and Fe oxyhydroxide veins in Pieces 9B, 10, 11, and 13.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-3R-6 (Section top: 65.83 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2-3	2	1	1.5	Euhedral to subhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxide and perhaps altered olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	30	3	Round to irregular

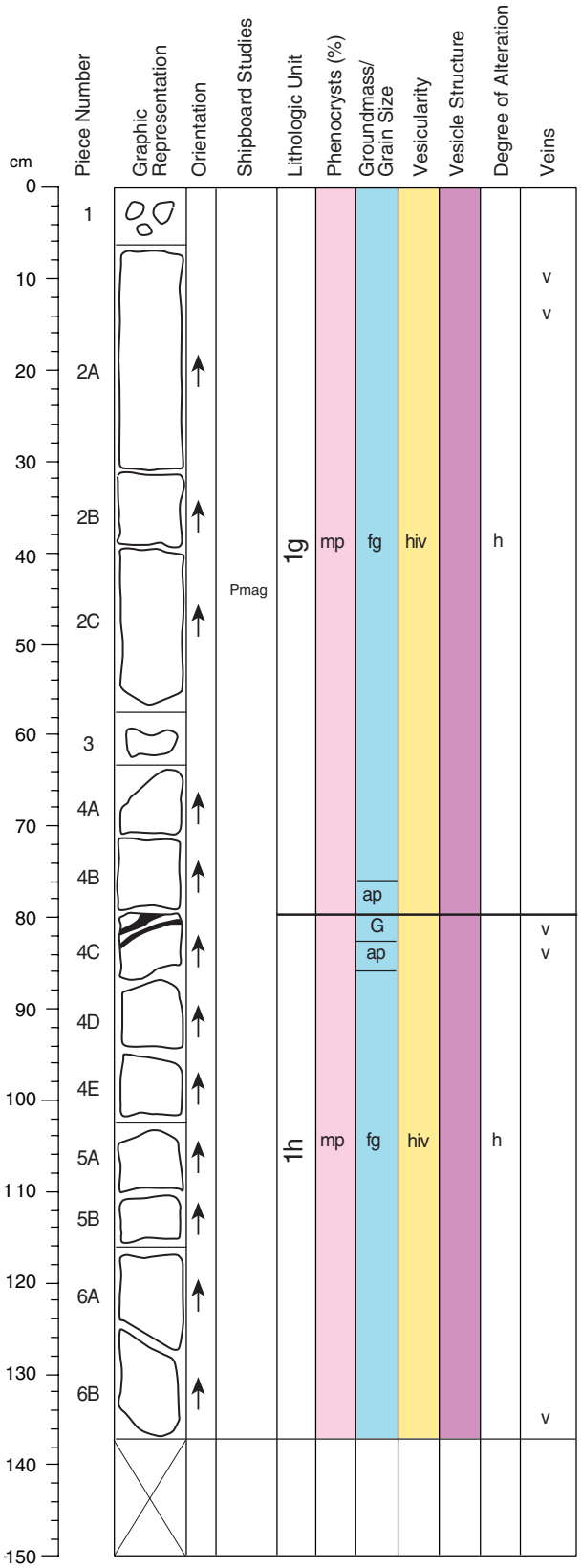
COLOR: Light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Possible lobe margin is present between Pieces 1 and 2 on the basis of symmetrical size grading in vesicle size, that decreases toward the margin.

ALTERATION: High. Olivine phenocrysts and possibly groundmass olivine are completely altered to Fe oxyhydroxide. Some altered phenocrysts have the morphology of plagioclase, but a positive identification is not possible. Vesicles are dominantly filled with dark yellowish orange (10YR 6/1) clay, carbonate, very pale green (saponite/nontronite) and blue green clay (celadonite).

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-4R-1 (Section top: 66.1 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-5	2	0.2	0.5	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic. Consists of plagioclase, clinopyroxene, black oxide, and altered mesostasis in an intergranular texture, and possibly olivine microphenocrysts.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25-30	3	Round to elongate

COLOR: Light brownish gray (5YR 6/1).

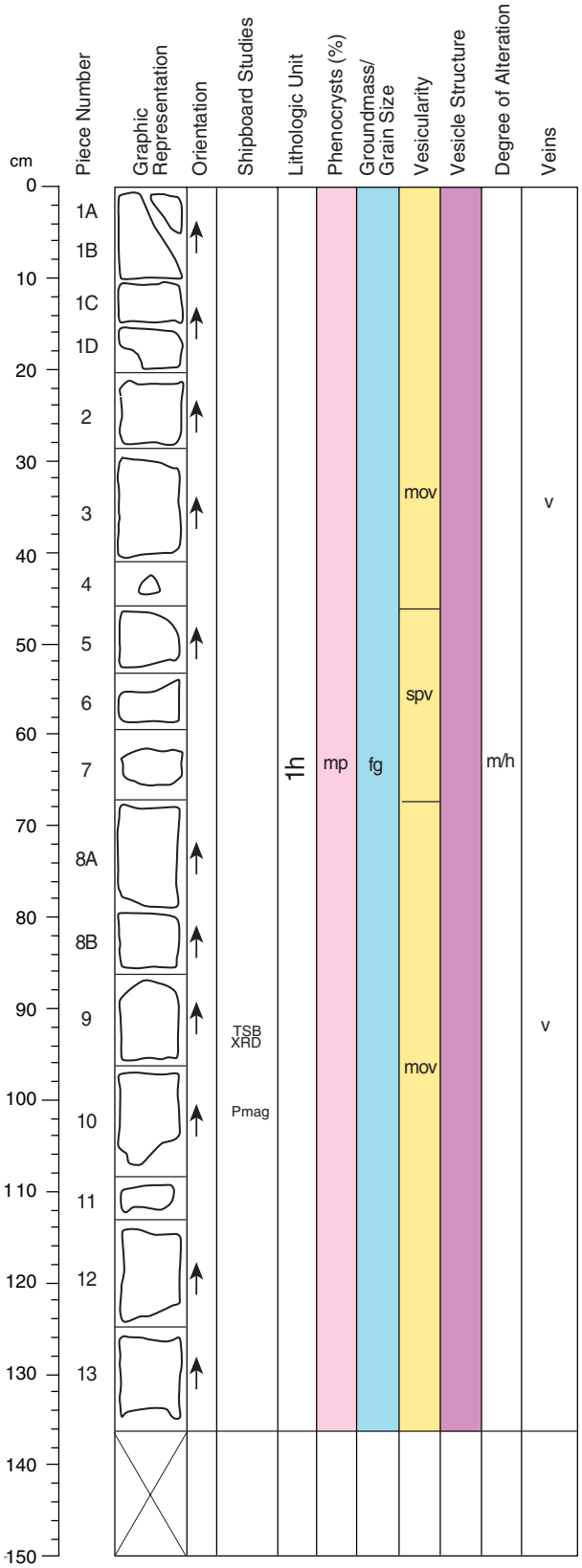
STRUCTURE: Lobed. A brecciated lobe margin containing altered glass is present in Piece 4 at 80 cm.

ALTERATION: High. Fe oxyhydroxide is pervasive and lines unfilled vesicles along with green clay. Vesicles are occasionally filed with white carbonate. Glass in the brecciated lobe margin is completely altered to brown clay and Fe oxyhydroxide. Olivine phenocrysts are completely replaced by Feoxyhydroxide and white carbonate. Clinopyroxene is partially replaced by Fe oxyhydroxide and mesostasis is altered to green clay.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins, <0.1-4 mm wide, are filled with carbonate.

COMMENTS: Piece 1 consists of three limestone dropstones, one of which is a gastropod fossil.
Vesicle size decreases from Piece 2A to the lobe boundary at 80 cm, then increases to Piece 6B. Vesicle abundance changes very little. Vesicles are usually single, but are coalesced in Piece 4B.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-4R-2 (Section top: 67.48 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-4	2	0.5	1	Subhedral; equant

GROUNDMASS: Fine grained. Contains plagioclase, clinopyroxene, black oxide, altered mesostasis and possibly olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
	4-15	3	Round to irregular

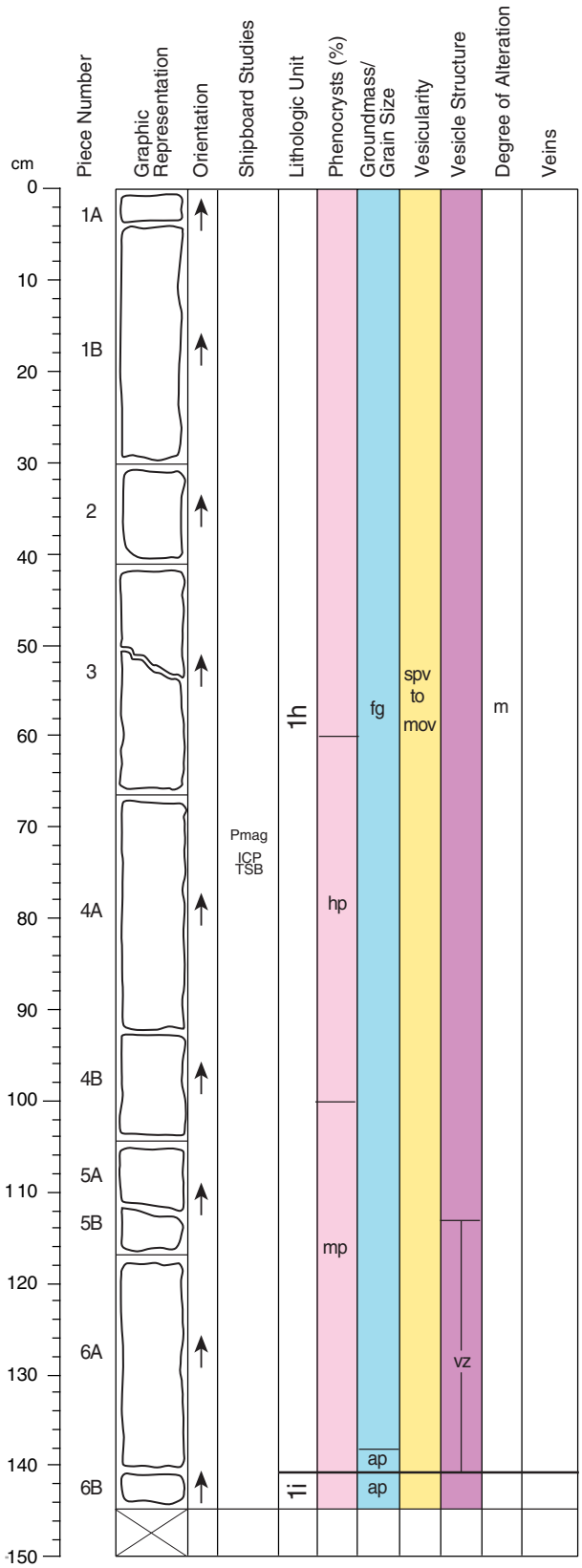
COLOR: Light brown (5YR 4/4).

STRUCTURE: Lobed. Lobe boundaries are present in the adjacent Sections 4R-1 and 4R-3.

ALTERATION: Moderate to high. Olivine phenocrysts are completely replaced by Fe oxyhydroxide and carbonate. The groundmass is stained brown with Fe oxyhydroxide, from alteration of groundmass olivine or clinopyroxene. Vesicles are filled with carbonate and Fe oxyhydroxide (0-80 cm), or green clay (80-136 cm).

VEINS/FRACTURES: Sparsely veined. Horizontal veins, about 1 mm wide, occur in Pieces 3 and 9, and are filled with carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-4R-3 (Section top: 68.84 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2-12	4	1	2	Subhedral; equant

GROUNDMASS: Fine grained to cryptocrystalline. Consists of plagioclase, clinopyroxene, olivine, black oxide and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
	3-15	3	Round

COLOR: Medium gray (N5), with a greenish tint.

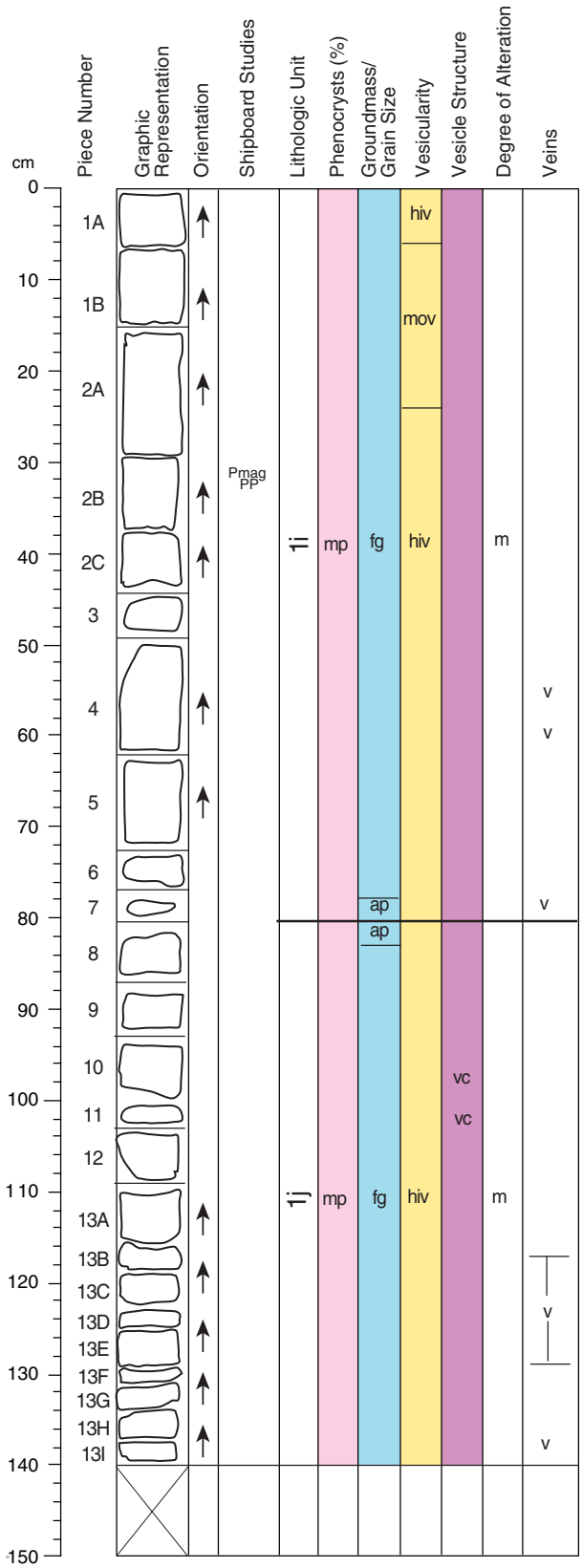
STRUCTURE: Lobed. A cryptocrystalline, vesicular lobe boundary is present at 140 cm, between Pieces 6A and 6B.

ALTERATION: Moderate. Olivine phenocrysts are partially to completely altered to carbonate, and Fe oxyhydroxide or blue-green clay. Vesicles are filled either with carbonate, or blue green clay.

VEINS/FRACTURES: None.

COMMENTS: The abundance of olivine phenocrysts varies widely throughout this section. From 0-60 cm, and from 100-144 cm, the rock is moderately olivine phyric. Between 60 cm and 100 cm, the rock is highly olivine phyric, and most phenocrysts have unaltered centers.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-4R-4 (Section top: 70.29 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-5	2.5	0.2	0.6	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic. Consists of plagioclase, clinopyroxene, black oxide, and altered mesostasis in an intergranular texture, and possibly olivine microphenocrysts.

VESICLES:	% Mode	Size (mm): Average	Shape
	15-30	3	Round to elongate

COLOR: Light brownish gray (5YR 6/1) to medium gray (N5).

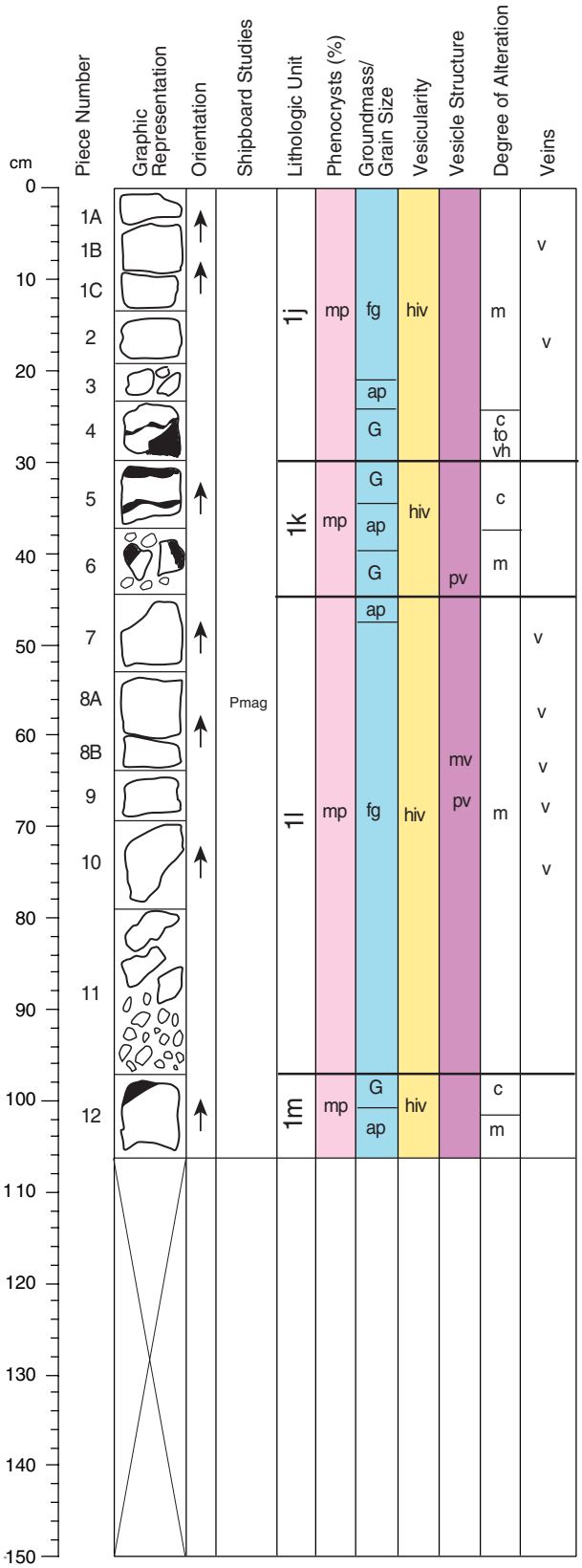
STRUCTURE: Lobed. Based on changes in vesicle size and morphology (round except close to the lobe boundary at 80 cm where the vesicles become elongate).

ALTERATION: Moderate. Fe oxyhydroxide alteration halos are present adjacent to the lobe boundary and veins. Vesicles are filled with green clay (which makes them difficult to identify) and white carbonate, or are unfilled. Olivine is replaced by green clay and white carbonate. Mesostasis is altered to green clay.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins, <0.1-5 mm wide, are filled with carbonate, green clay, and occasionally Fe oxyhydroxide.

COMMENTS: Vesicle cylinders are present in Pieces 10 and 11, filled with segregated material (slightly larger plagioclase laths than the groundmass), giving the rock a brecciated appearance. Unaltered olivine is present in Piece 13A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-4R-5 (Section top: 71.7 mbsf)

UNIT 1: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-5	2	0.2	0.8	Euhedral to subhedral; equant

GROUNDMASS: Fine grained to aphanitic. Consists of plagioclase, clinopyroxene, and altered mesostasis in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25-30	1.5	Round

COLOR: Medium dark gray (N4), medium gray (N5), to grayish green (10GY 5/2).

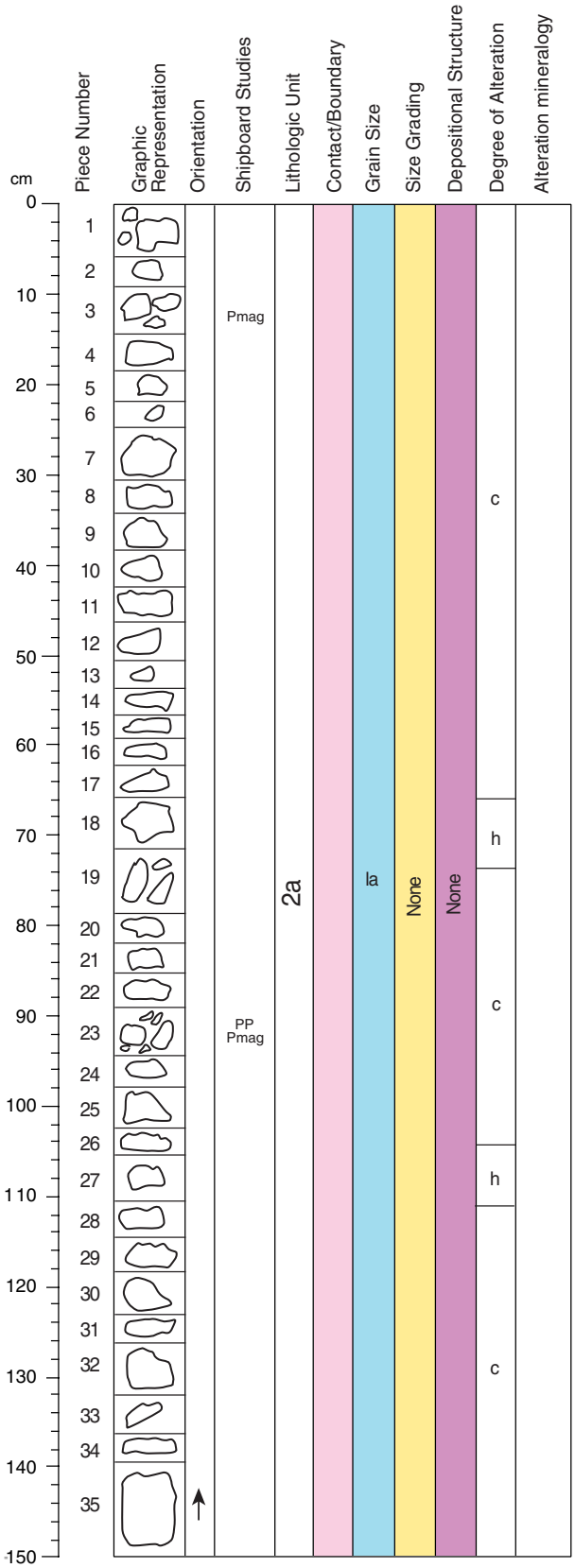
STRUCTURE: Lobed. Brecciation in Pieces 4 and 5 represents a lobe boundary. Breccia contains clasts of completely altered glass. Glassy lobe margins are also present between Pieces 6 and 7 and 11 and 12.

ALTERATION: Moderate to complete. Green clay is pervasive and has completely replaced the lobe margin glass as well as that in the groundmass. Vesicles are filled with green clay and white carbonate, or are unfilled. Olivine is replaced by green clay and white carbonate. Fe oxyhydroxide alteration halos are present adjacent to the lobe boundary and veins.

VEINS/FRACTURES: Moderately veined. Randomly oriented veins, <0.1-3 mm wide, are filled with carbonate, green clay, and occasionally Fe oxyhydroxide.

COMMENTS: Piece 8B contains an elongate megavesicle (~2.5 cm). A 2 cm pipe vesicle is present in Piece 9 and is filled with white carbonate. Rare plagioclase phenocrysts (1.5-3 mm) are present in Pieces 8A and 12. Unaltered olivine is also present in Piece 8A.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-5R-1 (Section top: 75.1 mbsf)

UNIT 2a: HYALOCLASTITE BASALT BRECCIA.

Pieces: 1-35

CONTACTS: None observed. The top of this unit is inferred to be between the bottom of Core 4R and the top of Core 5R.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Varied. Large clasts are light brownish gray (5YR 6/1). Most clasts are grayish yellowish green (5GY 7/2), and the matrix is greenish black (5GY 2/1).

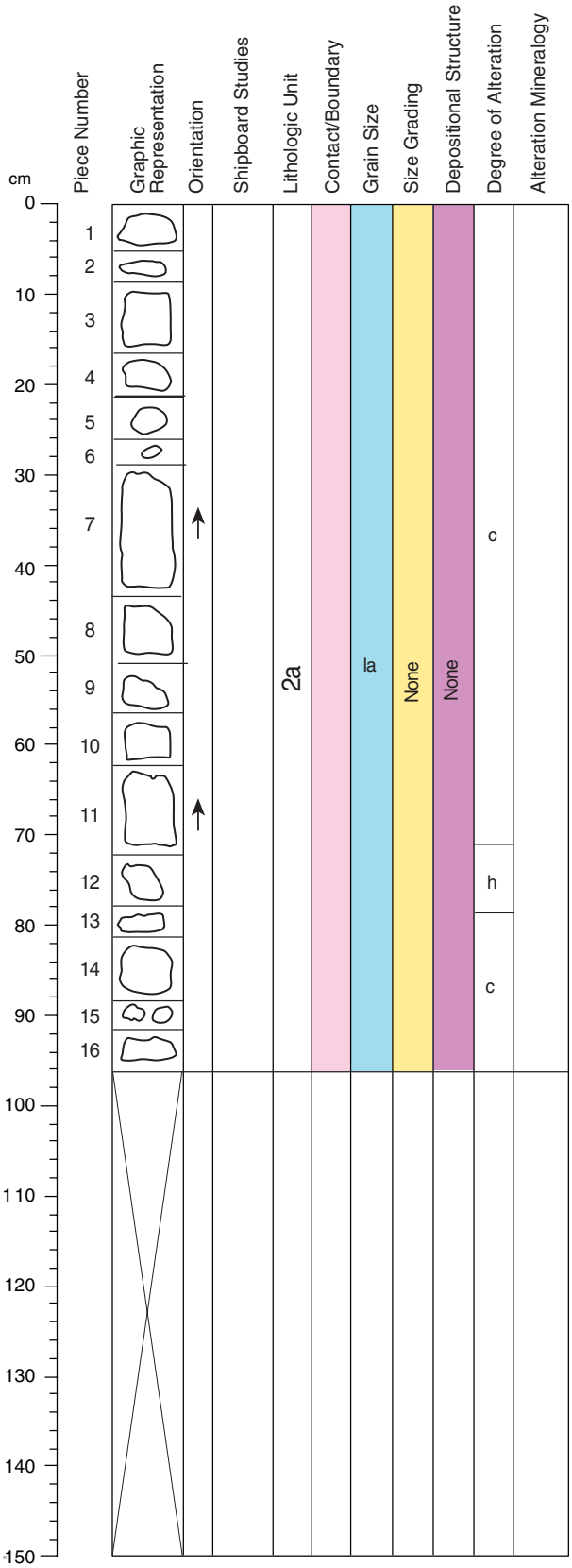
COMPONENTS: Angular clasts of vesicular basalt, mostly ≤20 mm wide, but a few are larger (≥50 mm) than the recovered piece (Pieces 18, 26, and 27). All but the largest clasts are completely altered to grayish yellowish green and greenish black clays with possible ghost-like outlines of former groundmass plagioclase. The largest clasts are only highly altered, and contain outlines of ≤3% olivine phenocrysts ≤3 mm wide and completely replaced by greenish gray and light gray clays. The matrix is missing or replaced by greenish black and bluish black clays and clear crystalline material (not carbonate).

SEDIMENTARY TEXTURES: Unsorted and clast supported. Grain size 5-70 mm.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Piece 1 is reddish brown scoria that is assumed to be a dropstone.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-5R-2 (Section top: 76.6 mbsf)

UNIT 2a: HYALOCLASTITE BASALT BRECCIA.

Pieces: 1-16

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

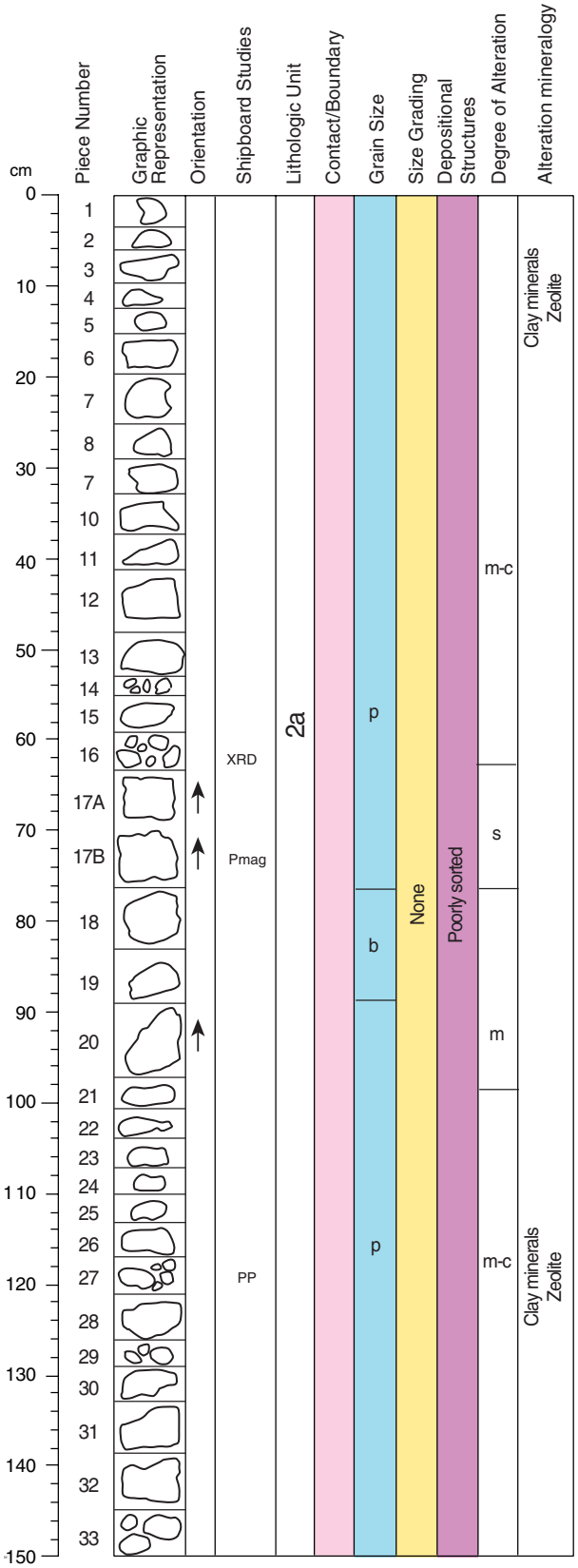
COLOR: Varied. Large clasts are light brownish gray (5YR 6/1). Most clasts are grayish yellowish green (5GY 7/2), and the matrix is greenish black (5GY 2/1).

COMPONENTS: Angular clasts of vesicular basalt, mostly ≤20 mm wide, but one is larger (≥50 mm) than the recovered piece (Piece 12). All but the largest clast are completely altered to grayish yellowish green and greenish black clays with possible ghost-like outlines of former groundmass plagioclase. The largest clast is only highly altered, and contain outlines of 3% olivine phenocrysts ≤3 mm wide and completely replaced by greenish gray and light gray clays. The matrix is missing or replaced by greenish black and bluish black clays and clear crystalline material (not carbonate).

SEDIMENTARY TEXTURES: Unsorted and clast supported. Grain size 5-70 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-6R-1 (Section top: 79.8 mbsf)

UNIT 2a: HYALOCLASTITE BASALT BRECCIA.

Pieces: 1-16

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is welded by altered glass in the upper half of the core and cemented by zeolites in the lower half.

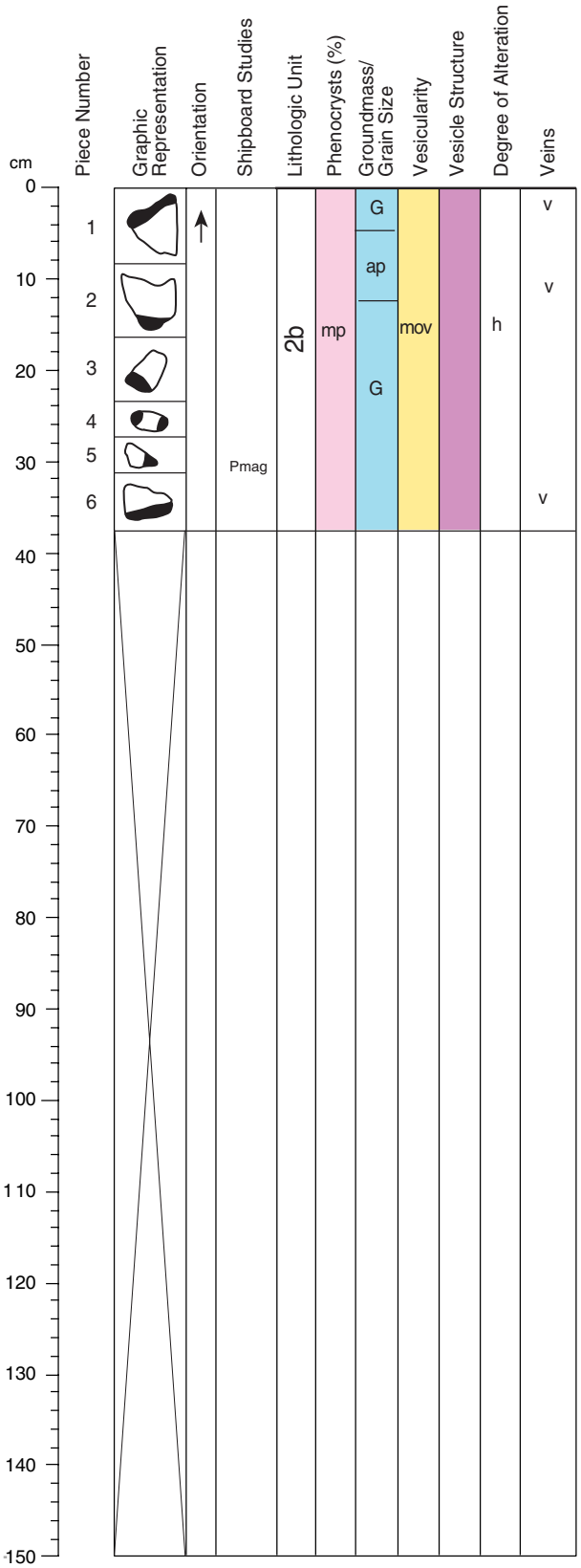
COLOR: Varied. Large clasts are light brownish gray (5YR 6/1) to medium gray (N5). Most clasts are grayish yellowish green (5GY 7/2) to dusky blue green (5BG 3/2), and the matrix is greenish black (5GY 2/1).

COMPONENTS: Angular clasts of highly vesicular basalt ranging in size from 0.5 cm to >5 cm. Pieces 18-23 are clasts of moderately olivine-phyric basalt containing euhedral to subhedral olivine phenocrysts (2%-3%, 0.5-2 mm) and occasional plagioclase phenocrysts (<<1%, 0.5 2 mm). Vesicles are filled with blue and green clay and white carbonate. The basalt clasts are moderately to completely altered and are sparsely veined, with veins filled with white carbonate. The larger clasts are the least altered. Glass is completely altered, except in Pieces 16 and 17A-17B, where it is unaltered and contains unaltered olivine.

SEDIMENTARY TEXTURES: Poorly sorted and clast supported. Grain size is 5 mm to >50 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-6R-2 (Section top: 81.3 mbsf)

UNIT 2b: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None observed. The boundary between Units 2A and 2B is inferred to be at the top of Section 6R-2.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	3	4	1	2	Subhedral; equant

GROUNDMASS: Aphanitic to glassy. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
Moderately vesicular	10-20	1	Subround

COLOR: Medium gray (N4), with a greenish tint in places.

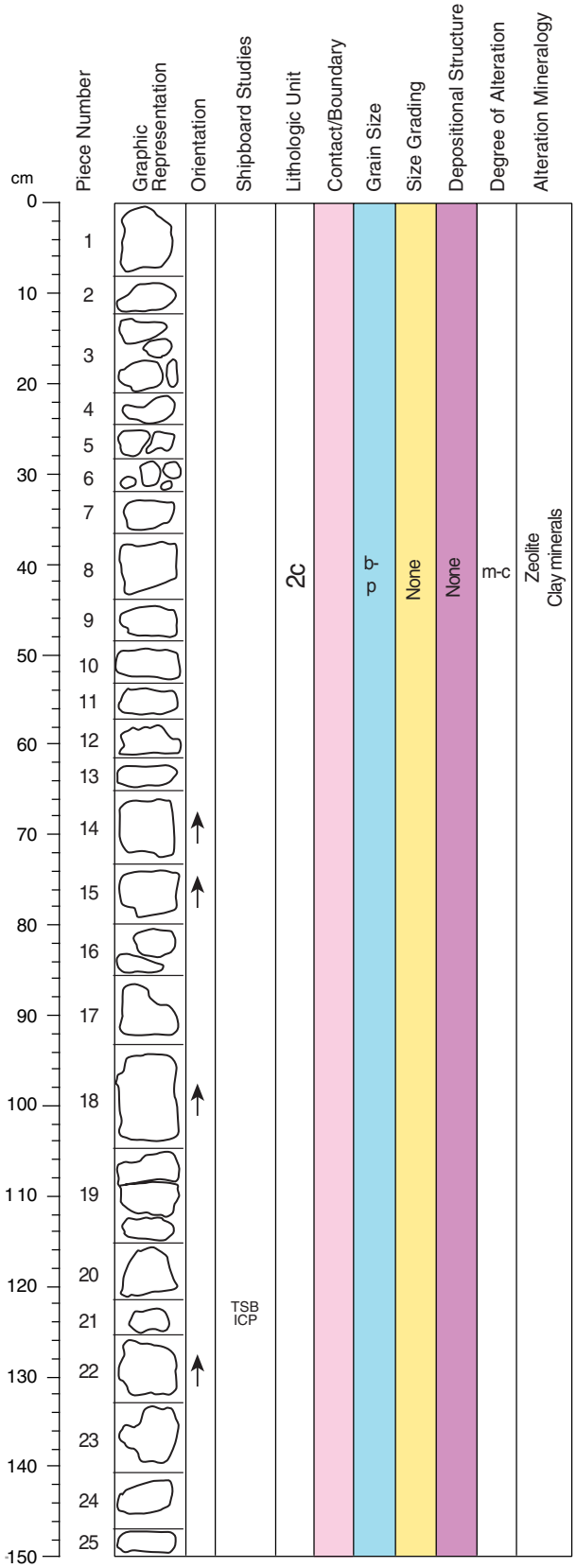
STRUCTURE: Lobed. Glassy lobe margins are present on most pieces.

ALTERATION: High. Olivine phenocrysts are completely altered to carbonate, and Fe oxyhydroxide or greenish gray clay. Groundmass is highly altered to dark gray clay. Glassy lobe margins are mostly devitrified, but some unaltered areas remain. Vesicles are filled with greenish gray clay or lined with indigo blue clay.

VEINS/FRACTURES: Sparsely veined. A few <1 mm wide randomly oriented, irregular veins are filled with gray and greenish gray clay.

COMMENTS: This subunit is petrographically very similar to Unit 1 and to the clasts in Unit 2A.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-7R-1 (Section top: 84.7 mbsf)

UNIT 2c: HYALOCLASTITE BASALT BRECCIA

Pieces: 1-25

CONTACTS: None observed. The boundary between Units 2B and 2C is inferred to be at the top of Section 7R-1.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by altered glass and zeolites. Clasts are vesicular basalt 0.5 cm to >6 cm and are moderately to completely altered. The smaller the clast, the higher the degree of alteration and the lighter its color. Olivine phenocrysts are present in most clasts. Plagioclase is occasionally present.

COLOR: Varied. Large clasts are light brownish gray (5YR 6/1) to medium gray (N5). Most clasts are grayish yellowish green (5GY 7/2) to dusky yellow green (5GY 5/2), and the altered glass is greenish black (5GY 2/1).

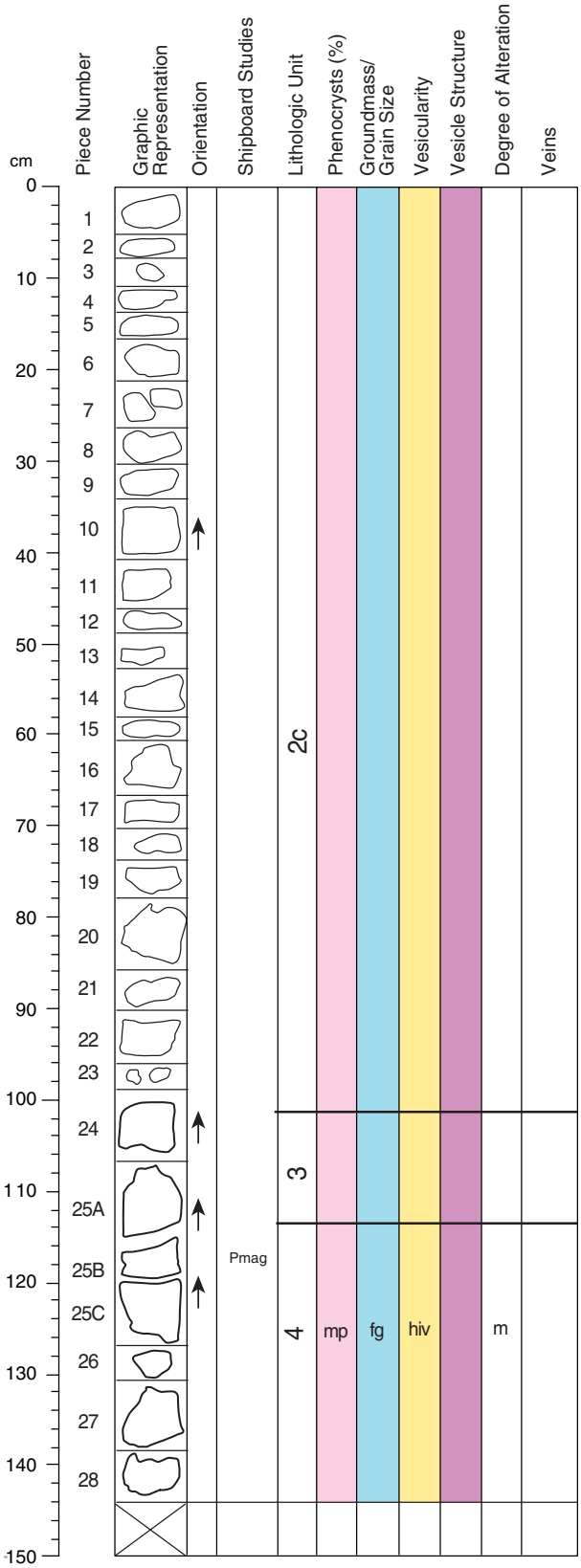
COMPONENTS: Angular clasts of moderately to highly vesicular basalt. Pieces 5, 7, 12, and 20-23 are totally basalt. Vesicles are round, 0.3-6 mm, and filled with blue clay, green clay, or white carbonate. Vesicles are occasionally lined with Fe oxyhydroxide. The basalt is moderately olivine-phyric (3%-6% olivine), with euhedral olivine phenocrysts ranging in size from 0.5 mm to 6 mm. Olivine is completely altered and replaced by Fe oxyhydroxide, green clay, and white carbonate. Plagioclase phenocrysts (0.5-5 mm) comprise <<1%, but occasionally form glomerocrysts with olivine (e.g., Piece 22).

SEDIMENTARY TEXTURES: Poorly sorted.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Unaltered olivine centers to some phenocrysts are present in Pieces 7 and 22. Zeolites are abundant in Pieces 24 and 25. From the base of Piece 17 to Piece 23 there is a small lobe with a glassy lobe margin present on several pieces.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-7R-2 (Section top: 86.2 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 25A-28

CONTACTS: The contact between Units 3 and 4 is in Piece 25A at 113 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	1	1.2	Subhedral; lath and blocky
Olivine:	5-7	2	0.4	0.8	Euhedral; equant

GROUNDMASS: Fine grained. Consists of plagioclase and clinopyroxene in an intergranular to subophitic matrix.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25-30	1.5	Subround

COLOR: Medium dark gray (N4).

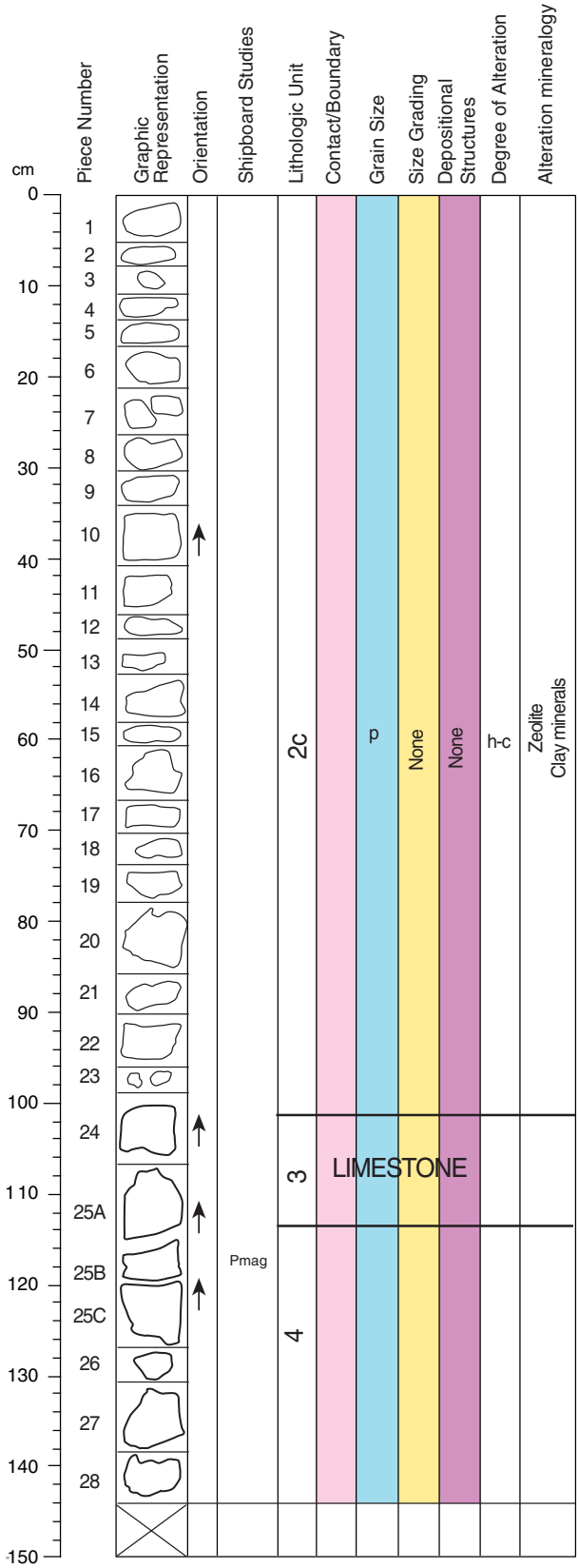
STRUCTURE: None.

ALTERATION: Moderate. Fe oxyhydroxide alteration halos are present around the sediment filled fracture. Vesicles are unfilled or filled with white carbonate, gray or green clay. Olivine phenocrysts are replaced by dark green clay and Fe oxyhydroxide. Plagioclase is stained green and partially sericitized.

VEINS/FRACTURES: The limestone of Unit 3 and basalt fragments fill a fracture that extends down the side of Pieces 25B, 25C, 27, and 28.

COMMENTS: Plagioclase that is stained green has an olivine look to it - the plagioclase morphology and fracture cleavage is still apparent. There may be unaltered olivine in Piece 27. There is no change in grain size at the contact with the limestone of Unit 3.
Unit 4 exhibits a magnetic polarity reversal compared to Unit 2.

Core Photo



VOLCANICLASTIC ROCK VISUAL CORE DESCRIPTION

197-1206A-7R-2 (Section top: 86.2 mbsf)

UNIT 2c: HYALOCLASTITE BASALT BRECCIA

Pieces: 1-24

CONTACTS: The contact between Units 2C and 3 is in Piece 24, dipping ~20° at interval 101 104 cm. A 1.5 cm thick interval of either finely laminated tuff or completely altered glassy lobe margin forms the contact with the underlying coralline limestone.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by altered glass and zeolites. Clasts are vesicular basalt 0.5 cm to 3 cm and are moderately to completely altered. The smaller the clast, the higher the degree of alteration and the lighter its color. Olivine phenocrysts are present in most clasts; plagioclase is occasionally present.

COLOR: Varied. Large clasts are light brownish gray (5YR 6/1). Most clasts are grayish yellowish green (5GY 7/2) to dusky yellow green (5GY 5/2), and the altered glass is greenish black (5GY 2/1).

COMPONENTS: Angular clasts of moderately to highly vesicular basalt, some of which have a quenched rim to them. Vesicles are round, 0.3-3 mm, and filled with gray clay, green clay, or white carbonate. Vesicles are occasionally lined with Fe oxyhydroxide. The basalt is moderately olivine-phyric (3%-6% olivine), with euhedral olivine phenocrysts ranging in size from 0.4 mm to 3 mm. Olivine is completely altered and replaced by Fe oxyhydroxide, green clay, and white carbonate. Plagioclase phenocrysts (0.5-3.5 mm) comprise <<1%).

SEDIMENTARY TEXTURES: Poorly sorted.

SEDIMENTARY STRUCTURES: Massive.

UNIT 3: CORALLINE LIMESTONE

Pieces: 24-25

CONTACTS: The contact between Units 2C and 3 is in Piece 24, dipping ~20˚ at interval 101 104 cm. A 1.5 cm thick interval of either finely laminated tuff or completely altered glassy lobe margin forms the contact with the underlying coralline limestone. The contact between Units 3 and 4 is in Piece 25A at 113 cm. The limestone of Unit 3 fills a fracture that extends down the side of Pieces 25B, 25C, 27, and 28.

GENERAL DESCRIPTION: Limestone rich in coral and shell fragments and sand- to silt-size lithic clasts.

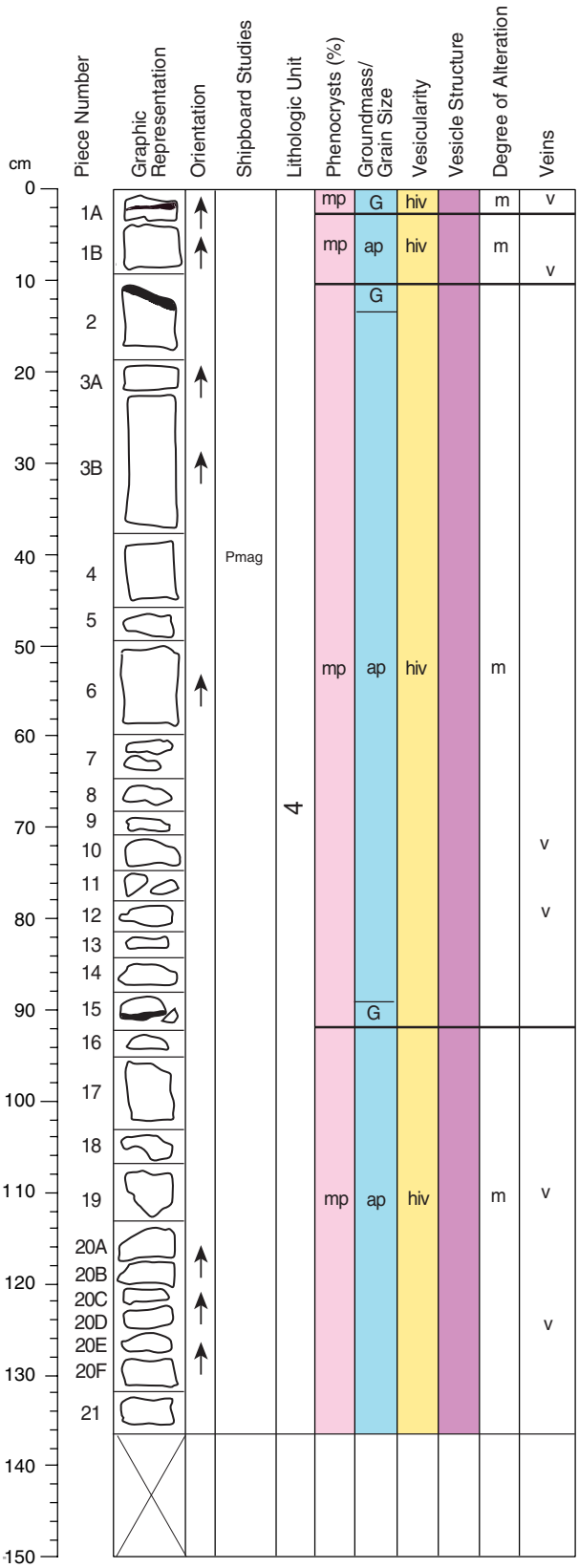
COLOR: Pale greenish yellow (10Y 8/2). Bluish white (5B 9/1).

COMPONENTS:

SEDIMENTARY TEXTURES: Poorly sorted.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-7R-3 (Section top: 87.65 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-21

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	7	3	0.5	1.5	Euhedral; equant

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	20-50	2	Subround

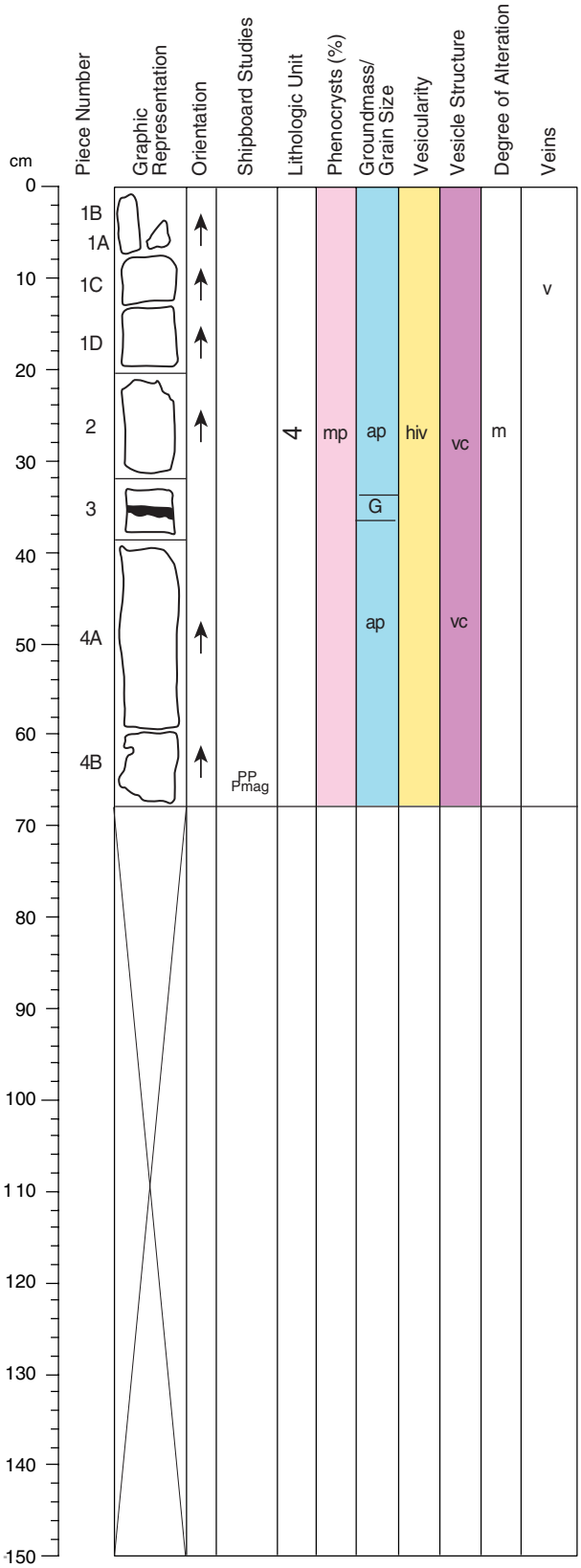
COLOR: Medium gray (N4), to brownish gray (5YR 4/1) in Pieces 10-17.

STRUCTURE: Lobed. Glassy lobe margins are present on Pieces 1 and 2. A basal lobe surface is preserved in Piece 15.

ALTERATION: Moderate. Olivine phenocrysts are slightly to highly altered to Fe oxyhydroxide or dark greenish gray clay. Groundmass is moderately altered to dark gray clay. Glassy margins are mostly devitrified, but some unaltered areas remain. Vesicles are lined or filled with carbonate.

VEINS/FRACTURES: Moderately veined. Veins are ≤6 mm wide, randomly oriented, and filled with carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-7R-4 (Section top: 89.01 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	7	3	0.5	1.5	Euhedral; equant

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxide and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25-30	3	Irregular

COLOR: Medium gray (N4).

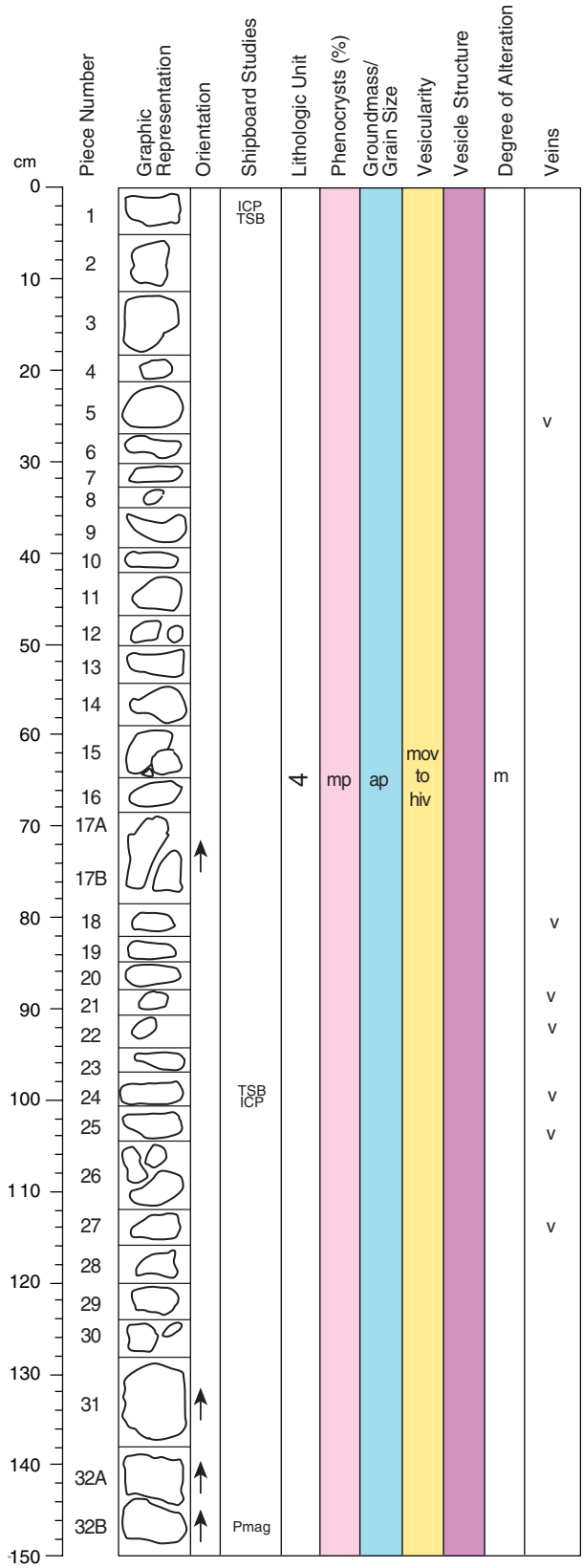
STRUCTURE: Lobed, based on the presence of glassy lobe margins in Section 7R-3.

ALTERATION: Moderate. Olivine phenocrysts are slightly to highly altered to Fe oxyhydroxide or dark greenish gray clay. Groundmass is moderately altered to dark gray clay. Glassy lobe margins are mostly devitrified, but some unaltered areas remain. Vesicles are lined with greenish gray clay.

VEINS/FRACTURES: Moderately veined. Veins are ≤6 mm wide, randomly oriented, and filled with carbonate.

COMMENTS: Vesicle cylinders occur in Pieces 2 and 4A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-8R-1 (Section top: 90.4 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-32

CONTACTS: None.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	5	2	0.5	1	euhedral; equant

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:

	%	Size (mm):	
	Mode	Average	Shape
	10-25	2	Round to irregular

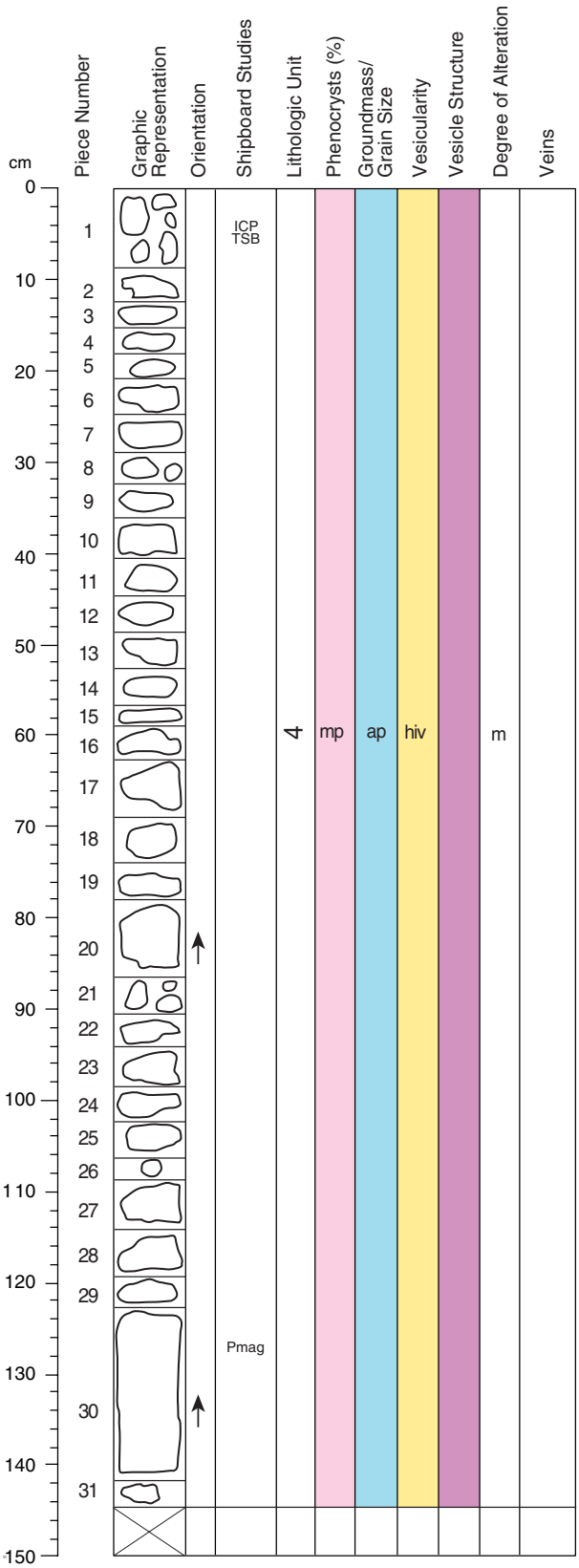
COLOR: Medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are completely altered to Fe oxyhydroxide and yellowish gray clay. Groundmass is moderately altered to dark gray clay. Vesicles are lined with dark bluish gray clay or lined or filled with carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are ≤1 mm wide, randomly oriented, and filled with carbonate. Moderately fractured. Fractures are ≤15 mm wide and filled with detrital carbonate and lithic fragments (e.g., Pieces 18, 21, 22, 24, 25, and 27). Bedded carbonate occurs in Piece 23A.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-8R-2 (Section top: 91.9 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-31

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2-7	2	0.5	1	Euhedral; equant

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25	2	Round

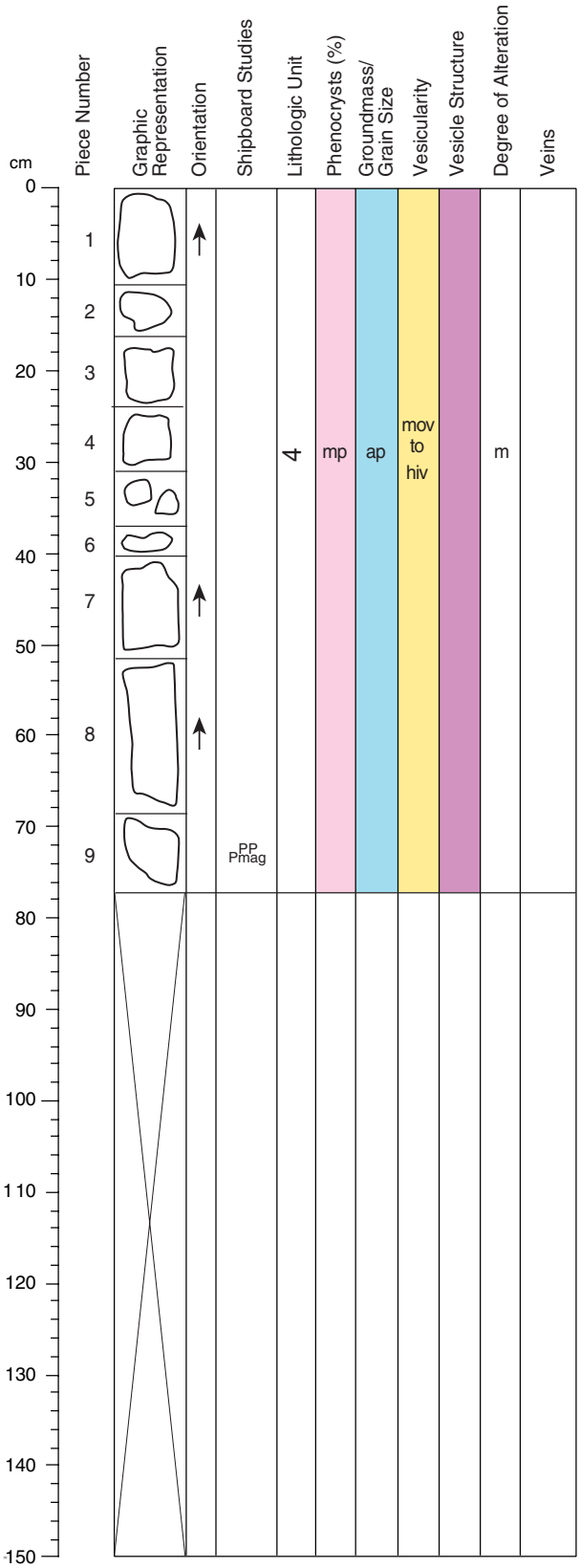
COLOR: Medium gray (N4) to pale yellowish brown (10YR 6/2).

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are completely altered to Fe oxyhydroxide and yellowish gray clay. Groundmass is moderately altered to dark gray clay. Vesicles are lined with dark bluish gray clay (from 0-20 cm) or lined with Fe oxyhydroxide (below 20 cm).

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-8R-3 (Section top: 93.36 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

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

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
	10-60	2	Irregular

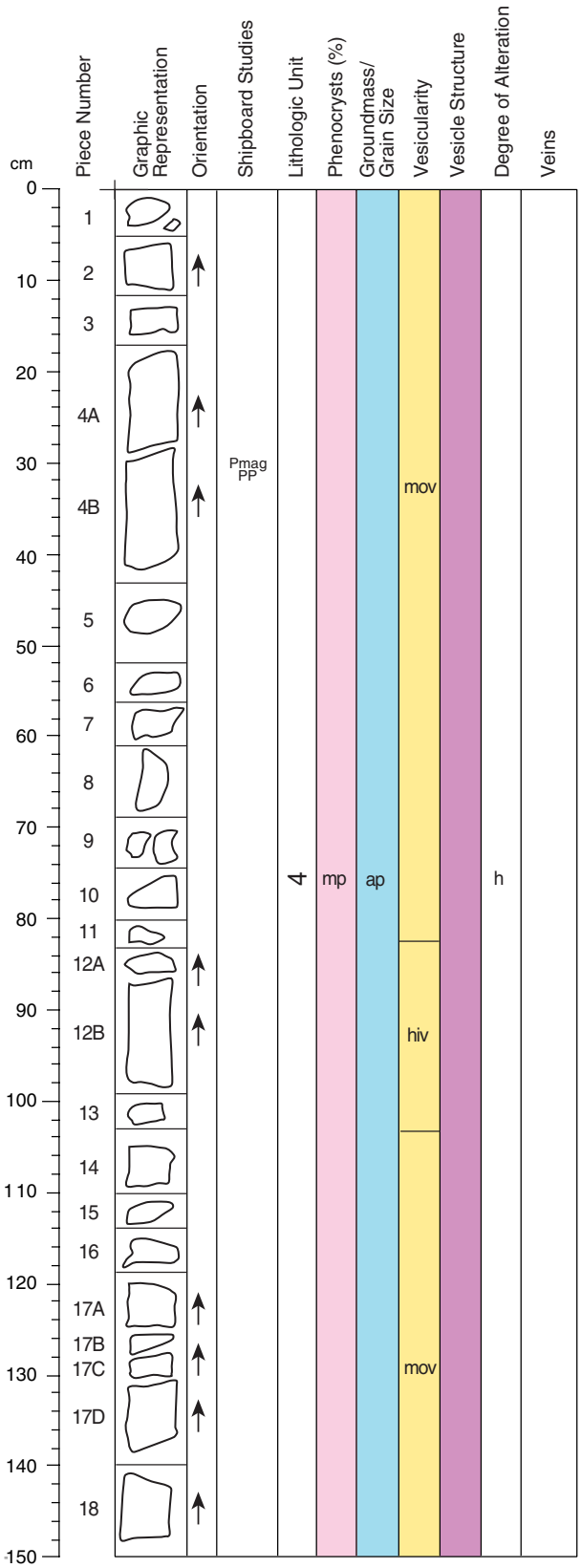
COLOR: Medium gray (N6) with Fe-oxyhydroxide staining.

STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are completely altered to Fe oxyhydroxide and yellowish gray clay. Groundmass is moderately altered to dark gray clay. Vesicles are lined with Fe oxyhydroxide.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-9R-1 (Section top: 94.7 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-18

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	7	3	0.5	2	Euhedral to anhedral

GROUNDMASS: Aphanitic. Consists of plagioclase, clinopyroxene, black oxides, possibly altered olivine and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
0-83 cm	20	1	Round
83-103 cm	30	3	Round to irregular
103-150 cm	15	3	Elongated

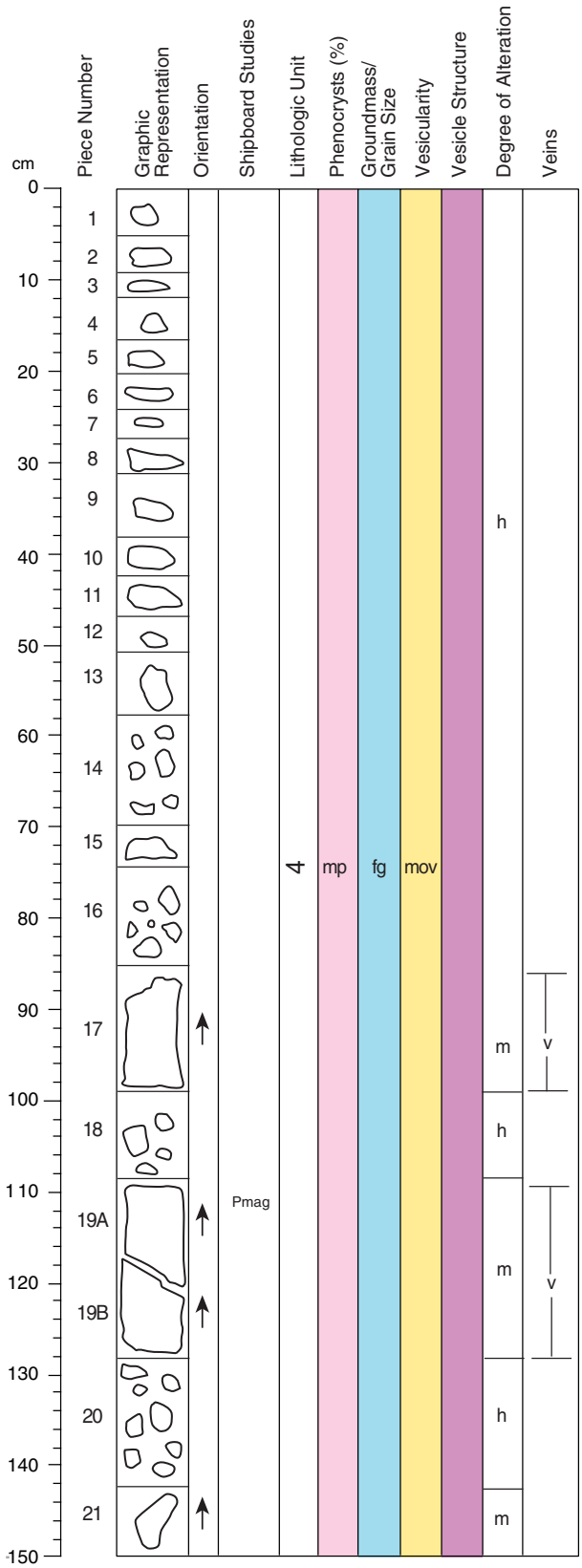
COLOR: Light brownish gray (5YR 6/2) to pale yellow brown (10YR 6/2).

STRUCTURE: Vesicular.

ALTERATION: High. Olivine phenocrysts are completely altered to Fe oxyhydroxide, green clay and white carbonate. Groundmass is moderately altered to dark gray/black clay. Vesicles are filled with white carbonate and dark yellowish orange clay (10YR 6/6). Zeolite occurs in Piece 1.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-9R-2 (Section top: 96.2 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-21

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	9	3	0.5	1.5	Euhedral; equant Rarely skeletal

GROUNDMASS: Fine grained. Consists of plagioclase, clinopyroxene, black oxides and altered glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	8	6	Round

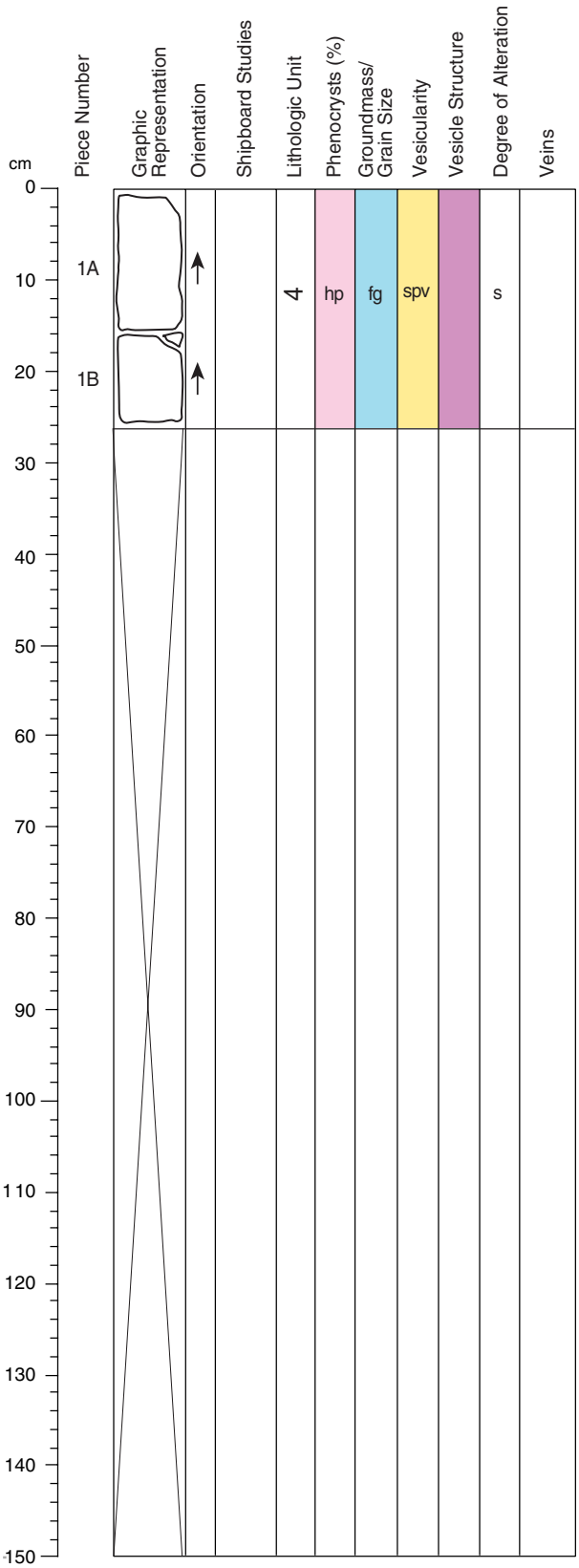
COLOR: Medium gray (N6).

STRUCTURE: Massive. No convincing evidence for the presence of lobes in this section.

ALTERATION: Moderate to high. High in smaller pieces. Olivine phenocrysts are completely altered to Fe oxyhydroxide, green clay and white carbonate. Groundmass is moderately altered to dark gray/black clay. Vesicles are filled with white carbonate and celadonite.

VEINS/FRACTURES: Moderately veined. Veins are 0.5-4 mm wide, and are lined with celadonite and filled with white carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-10R-1 (Section top: 104.4 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15	5	0.5	3	Euhedral to subhedral

GROUNDMASS: Fine grained. The groundmass consists of plagioclase, clinopyroxene, black oxide and olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	3	Round

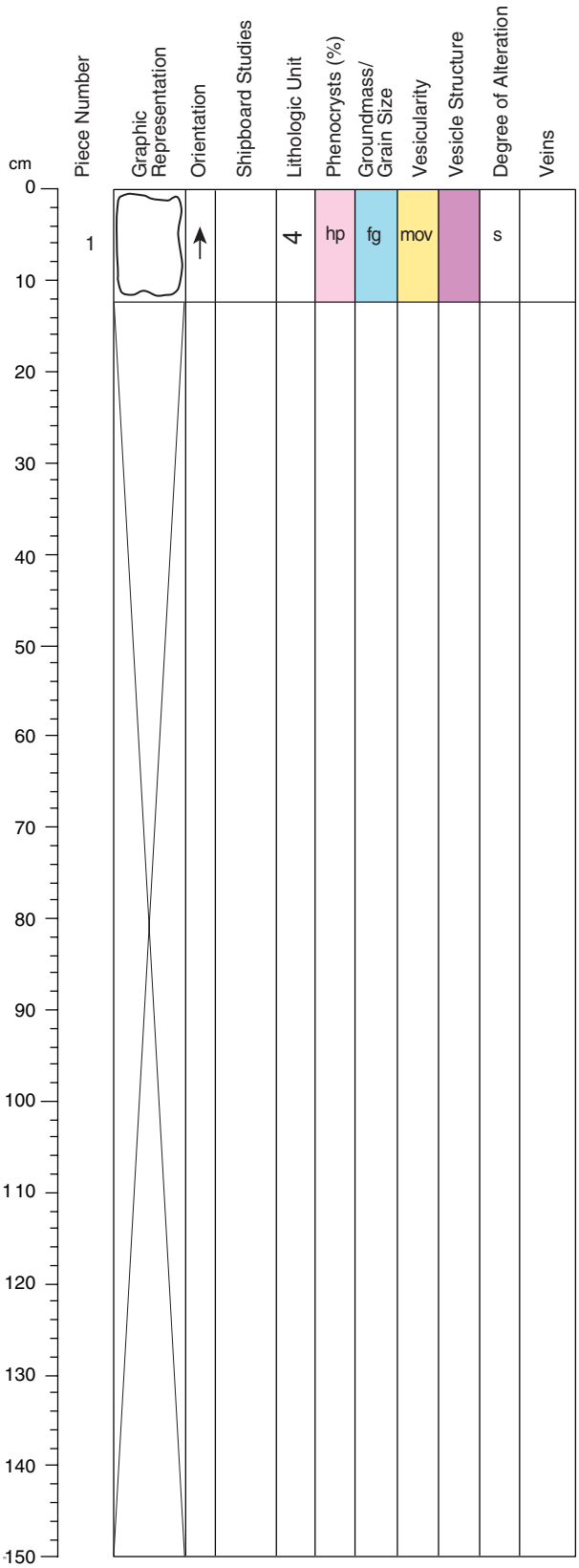
COLOR: Medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Vesicles are filled with pale green clay. Olivine phenocrysts are partially altered to Fe oxyhydroxide or are unaltered. Groundmass olivine, however, is unaltered.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-11R-1 (Section top: 106.1 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15	10	0.5	2	Euhedral to subhedral

GROUNDMASS: Fine grained. The groundmass consists of plagioclase, clinopyroxene, black oxide and olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	3	Round

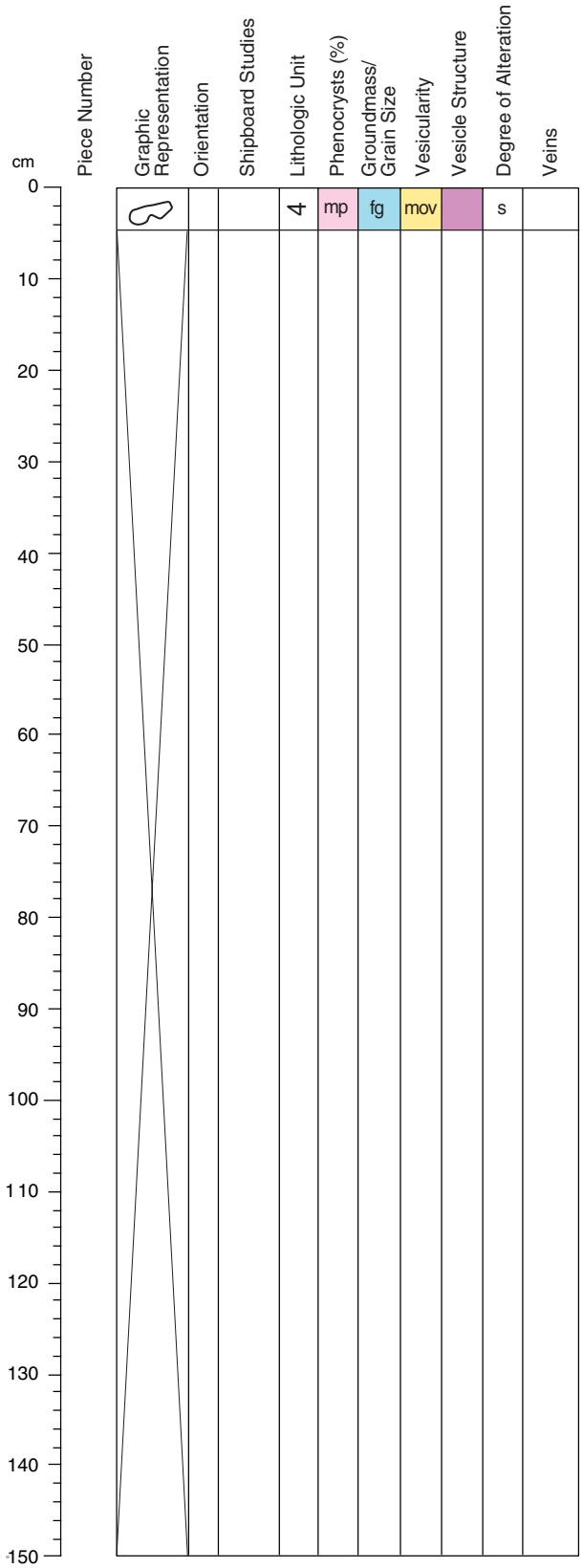
COLOR: Medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Vesicles are filled with pale green clay. Olivine phenocrysts are partially altered to Fe oxyhydroxide or unaltered. Groundmass olivine, however, is unaltered.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-12R-1 (Section top: 114.0 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	7	3	0.5	1	Euhedral to subhedral

GROUNDMASS: Fine grained. The groundmass consists of plagioclase, clinopyroxene, black oxide and olivine.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
Moderately vesicular	10	1	Round to irregular

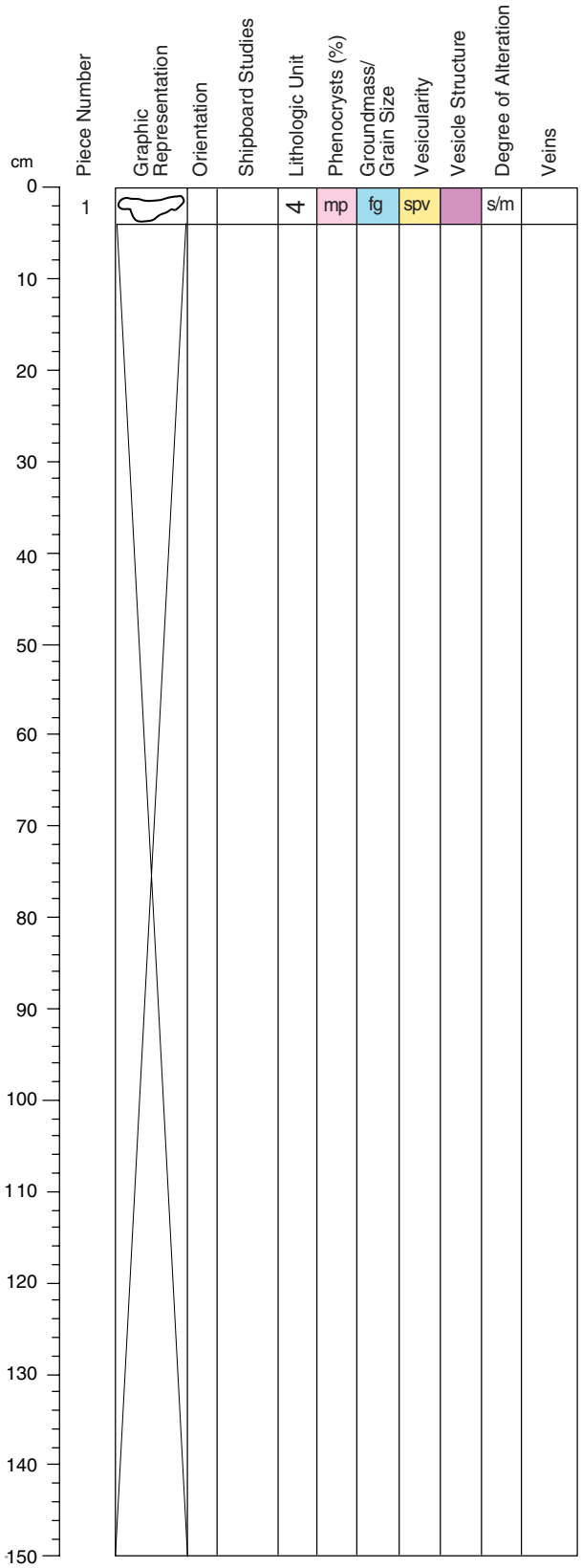
COLOR: Medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight. Vesicles are filled with pale green clay (talc?). Olivine phenocrysts are partially altered to Fe oxyhydroxide or unaltered. Groundmass olivine, however, is unaltered.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-13R-1 (Section top: 118.7 mbsf)

UNIT 4: SPARSELY TO HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	7	4	0.5	1	Euhedral to subhedral

GROUNDMASS: Fine grained. The groundmass consists of plagioclase, clinopyroxene, black oxides and olivine.

VESICLES:

	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	1	Round to irregular

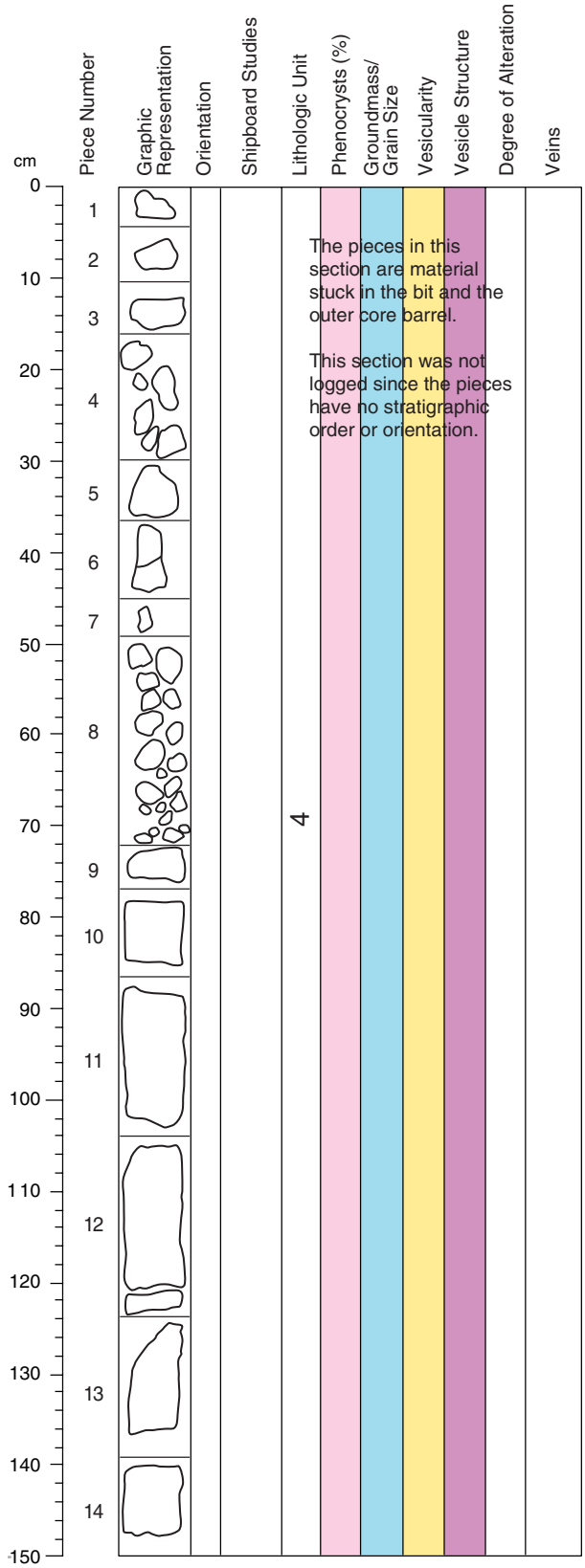
COLOR: Medium gray (N5).

STRUCTURE: Massive.

ALTERATION: Slight to moderate. Vesicles are filled with pale green clay or unfilled. Olivine phenocrysts are partially altered to Fe oxyhydroxide or unaltered. Groundmass olivine, however, is unaltered.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-14R-1 (Section top: 123.6 mbsf)

UNIT 4: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-14

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	10-25	10	0.5	5	Euhedral to subhedral

GROUNDMASS: Fine grained. The groundmass consists of plagioclase and clinopyroxene in an intergranular texture.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
	1-25	2	Round to elongate

COLOR: Medium gray (N5), light brownish gray (6YR 6/1), dusky yellow green (5GY 5/2).

STRUCTURE: Massive.

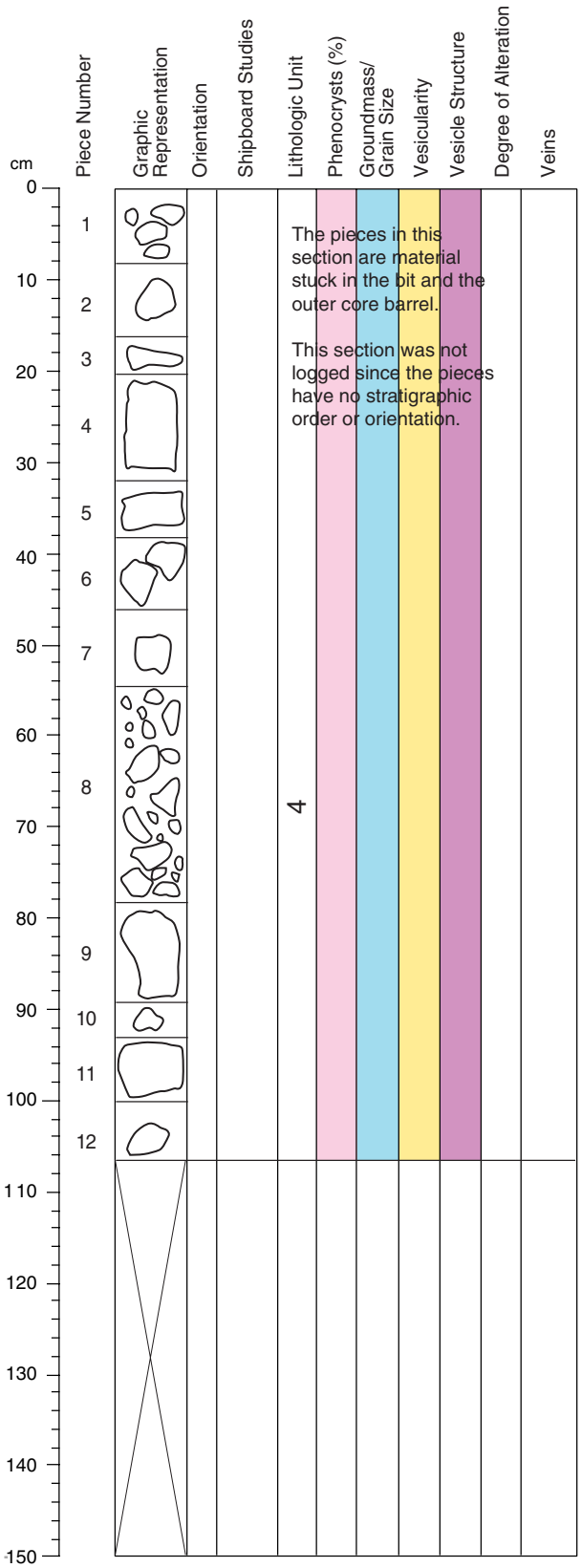
ALTERATION: Slight to high. Fe oxyhydroxide is pervasive in Piece 10. Vesicles are filled with pale green clay (that expands when wet) and carbonate stained with Fe oxyhydroxide (Piece 10). Olivine phenocrysts are rimmed by iddingsite, which is also developed along cleavages. Serpentine is developed in the crystal interiors, but unaltered relicts remain.

VEINS/FRACTURES: One vein at 119 cm is ~0.2 mm wide and filled with the pale green clay that fills the vesicles.

COMMENTS: Sections 14R-1 and 14R-2 represent the material that was clogging the drill bit between 104.4 and 128.2 mbsf. Unaltered olivine gives the rock a dusky yellow green color. Olivine is seriate between microphenocryst and phenocryst. Cr-spinel inclusions are present.

Piece 10 is a highly altered variant of the olivine-rich basalt in the rest of the section.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-14R-2 (Section top: 125.1 mbsf)

UNIT 4: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5-15	8	0.5	3	Euhedral to subhedral

GROUNDMASS: Fine grained to aphanitic. The groundmass consists of plagioclase and clinopyroxene in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
	2-30	2	Round to irregular

COLOR: Medium gray (N5), light brownish gray (6YR 6/1), dusky yellow green (5GY 5/2).

STRUCTURE: Massive.

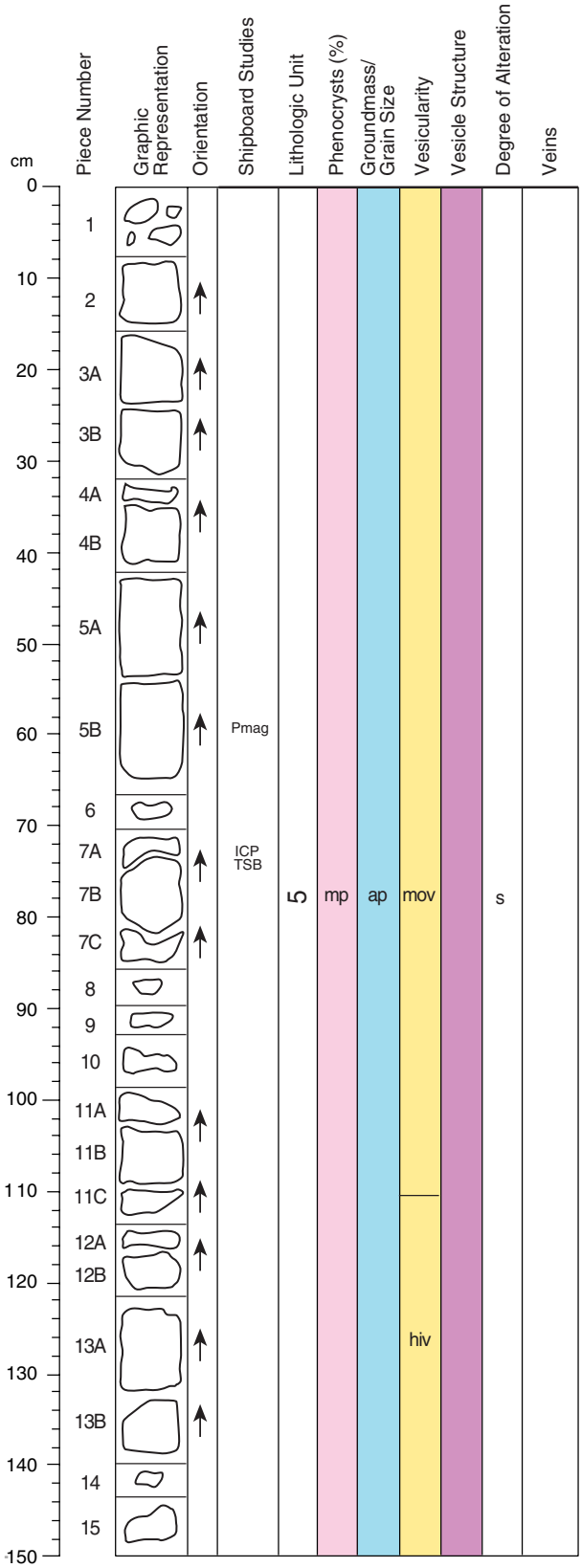
ALTERATION: Slight to high. Fe oxyhydroxide is pervasive in Pieces 4 to 6, and 10. Vesicles are filled with pale green clay (that expands when wet) and carbonate stained with Fe oxyhydroxide (Piece 10). Olivine phenocrysts are rimmed by iddingsite, which is also developed along cleavages. Serpentine is developed in the crystal interiors, but unaltered relicts remain. In Piece 9, olivine is replaced by green clay.

VEINS/FRACTURES: One vein (<1 mm wide) in Piece 7 is filled with green clay (smectite) and white carbonate.

COMMENTS: Sections 14R-1 and 14R-2 represent the material that was clogging the drill bit between 104.4 and 128.2 mbsf. Unaltered olivine gives the rock a dusky yellow green color. Olivine is seriate between microphenocryst and phenocryst. Cr-spinel inclusions are present.

Piece 9 may represent the aphanitic base of this olivine-rich unit as grain size and olivine abundance decreases. Pieces 4-6 and 10 are highly altered, vesicular variants of the olivine- rich basalt seen in Section 14R-1.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-15R-1 (Section top: 128.2 mbsf)

UNIT 5: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None. The boundary between Unit 4 and Unit 5 is inferred to be at the top of this section, because recovery was low in Cores 10R to 14R and the phenocryst assemblage of Unit 5 differs that of Unit 4.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5	5	0.5	2	Euhedral to subhedral
Plagioclase:	1	2	1	1	Anhedral
Clinopyroxene:	<1	2	1	1	Subhedral

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase, clinopyroxene, olivine and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
0-110 cm	7	<1	Round to irregular
110-150 cm	25	2	Round to irregular

COLOR: Medium light gray (N6).

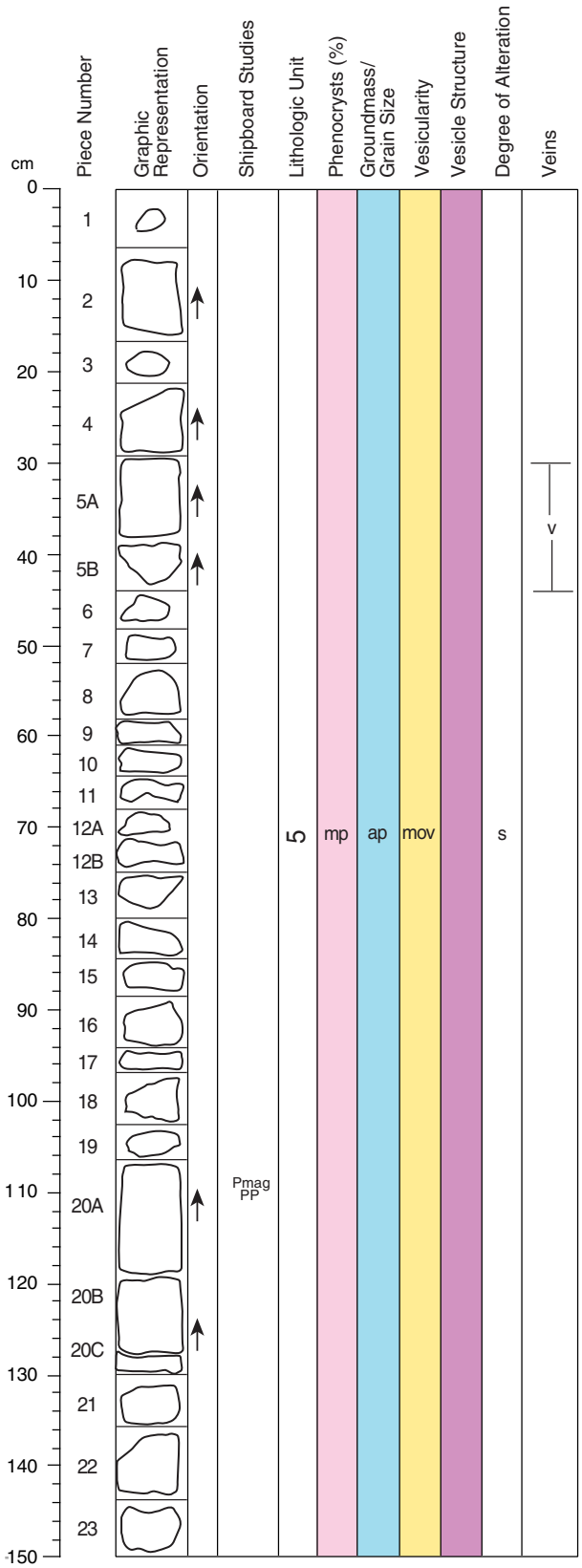
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are rimmed by iddingsite, which is also developed along fractures, and are usually replaced by green clay. Occasionally unaltered centers remain. Groundmass olivine is unaltered. Vesicles are lined with dark gray or pale green clays but are usually unfilled. Rarely they are filled with white carbonate and yellow orange clay.

VEINS/FRACTURES: Sparsely fractured. <1 mm wide, randomly orientated fractures are present throughout the section.

COMMENTS: Flow foliations in Pieces 3 and 11B-15 are defined by 1 mm subparallel wisps of dark material. Irregular vesicles are often elongated along flow foliation. Plagioclase and clinopyroxene phenocrysts are usually present as glomerocrysts intergrown with olivine.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-15R-2 (Section top: 129.7 mbsf)

UNIT 5: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-23

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	4	4	0.5	1.5	Euhedral to subhedral
Plagioclase	1-2	1.8	1	1.5	Anhedral

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase, clinopyroxene, black oxides and sulfides in an intergranular texture. Groundmass may include very slightly altered olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately Vesicular	5-7	6	Irregular

COLOR: Medium light gray (N6).

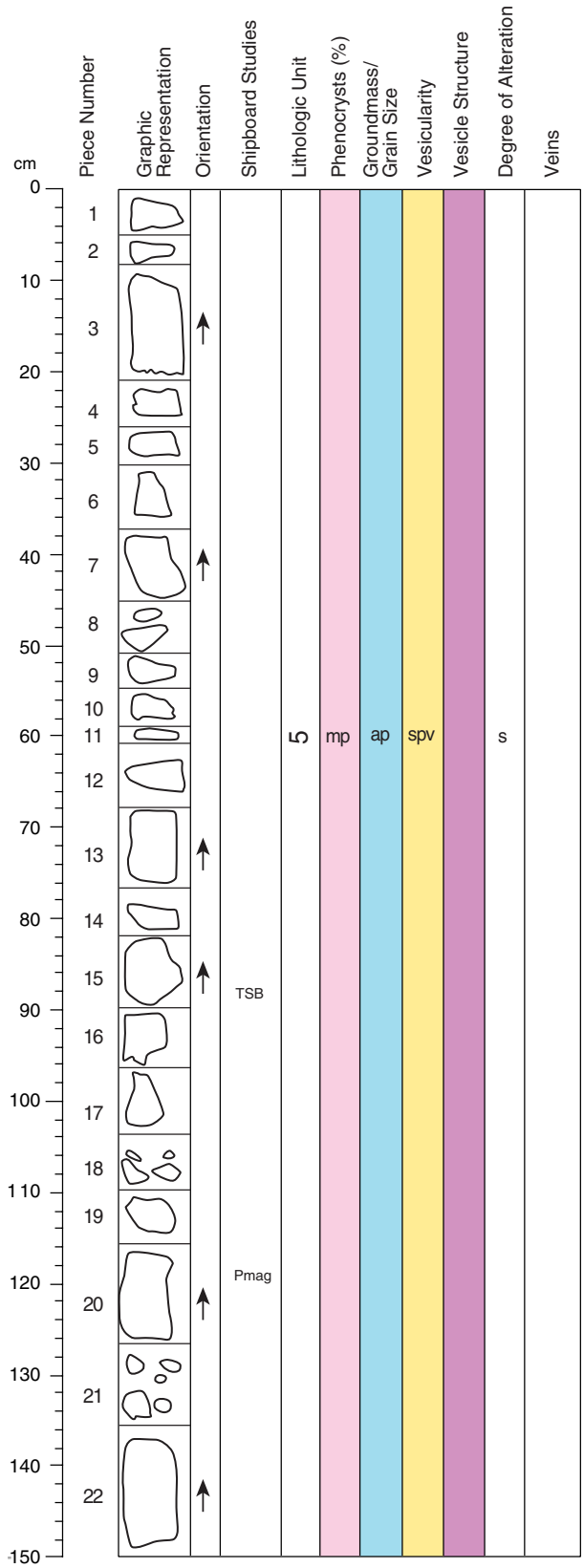
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are usually replaced by green clay and lined by iddingsite. Vesicles are filled with gray or green clay. Occasionally they contain very small (<1 mm) clear euhedral crystals (not calcite).

VEINS/FRACTURES: One carbonate filled vein from 30-40 cm.

COMMENTS: A flow foliation is present, defined by 1 mm subparallel wisps of dark brown material. Irregular vesicles are often elongated along flow foliation.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-15R-3 (Section top: 131.2 mbsf)

UNIT 5: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-22

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-4	8	0.5	3	Euhedral to subhedral
Plagioclase	2-3	6	1	3	Anhedral

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase, clinopyroxene and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	4-5	2	Round to irregular

COLOR: Medium light gray (N6).

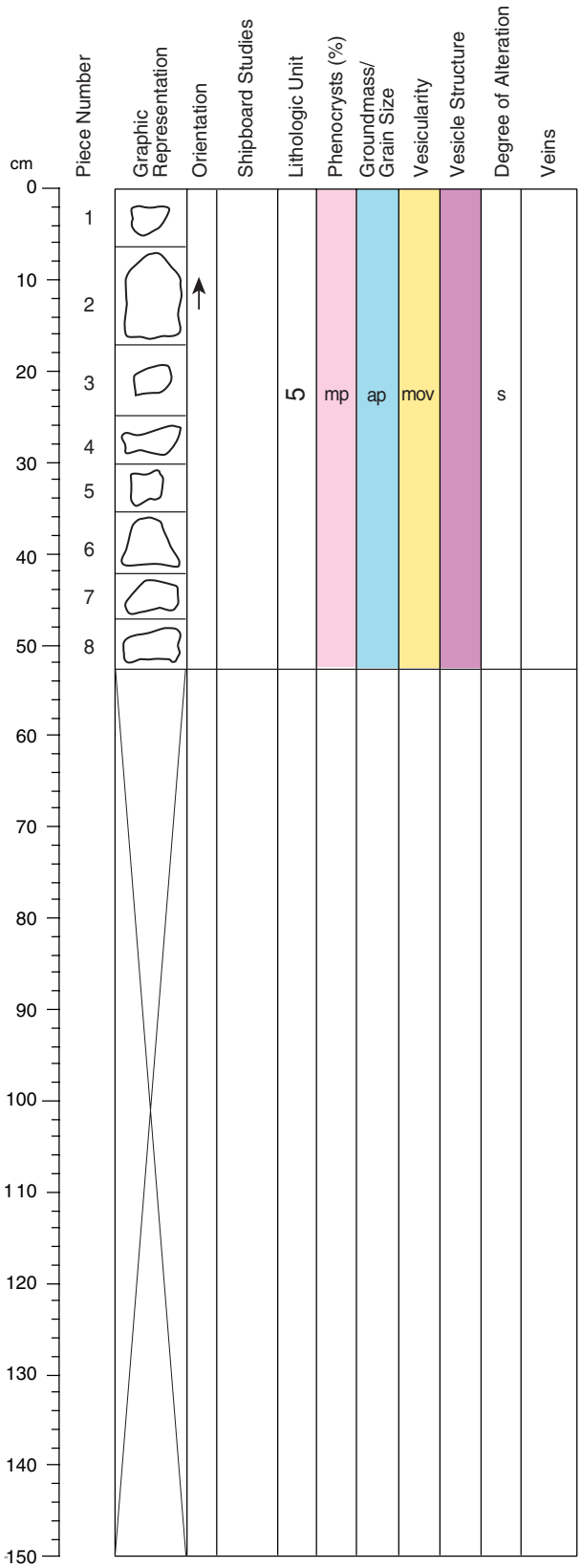
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are rimmed by iddingsite, which is also developed along fractures, and are usually replaced by green clay (celadonite?). Occasionally unaltered centers remain (e.g., in Piece 13). Vesicles are lined with dark gray clays but are usually filled. Rarely they are filled with white carbonate and yellow orange clay (e.g., in Piece 13).

VEINS/FRACTURES: None.

COMMENTS: A flow foliation is present, defined by 1 mm subparallel wisps of dark material. Irregular vesicles are often elongated along flow foliation. An 8 mm xenocrystic glomerocryst is present in Piece 13. It consists of subrounded olivine, plagioclase and some clinopyroxene. Some of the olivine is altered to green clay, but others remain unaltered.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-15R-4 (Section top: 132.7 mbsf)

UNIT 5: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-8

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5	5	0.5	2	Euhedral to subhedral
Plagioclase	1	3	1	1	Anhedral
Clinopyroxene	<1	2	1	1	Subhedral

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase, clinopyroxene, olivine and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	2	Round to irregular

COLOR: Medium light gray (N6).

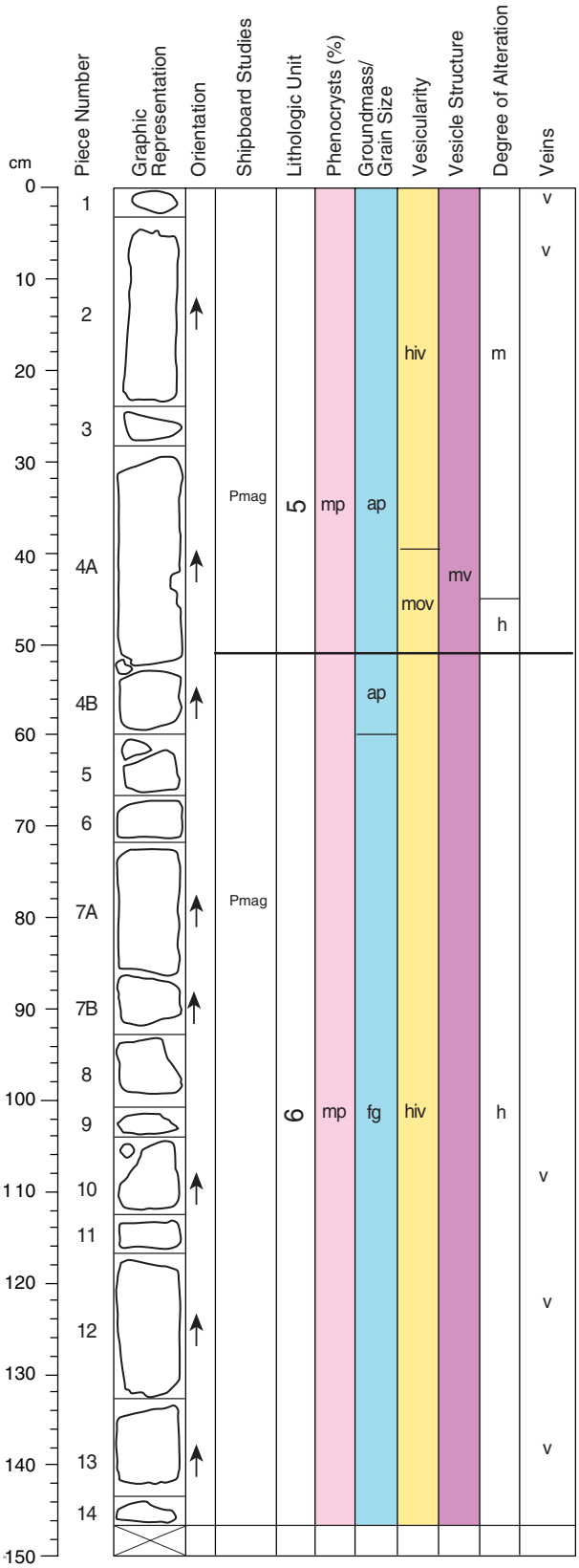
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are rimmed by iddingsite, which is also developed along fractures, and are usually replaced by green clay. Occasionally unaltered centers remain. Vesicles are lined with dark gray clays but are usually unfilled.

VEINS/FRACTURES: None.

COMMENTS: Flow foliations are present throughout the section, defined by 1 mm subparallel wisps of dark material. Irregular vesicles are often elongated along flow foliation.
Plagioclase and clinopyroxene phenocrysts are usually present as glomerocrysts intergrown with olivine.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-1 (Section top: 133.2 mbsf)

UNIT 5: MODERATELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-4A

CONTACTS: The contact between Units 5 and 6 is present in Piece 4A at 51 cm, based on a change from brecciated to coherent basalt and a change in phenocryst content.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	4-6	5.5	0.5	2	Euhedral; equant
Plagioclase	2-3	2.5	0.5	1.5	Subhedral; blocky

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase, clinopyroxene, and altered glass.

VESICLES:

% Mode	Size (mm): Average	Shape
1-8	1	Irregular

COLOR: Light gray (N7), dark reddish brown (10R 3/4).

STRUCTURE: Massive with subhorizontal flow foliation. Brecciated in Piece 4A between 45-51 cm.

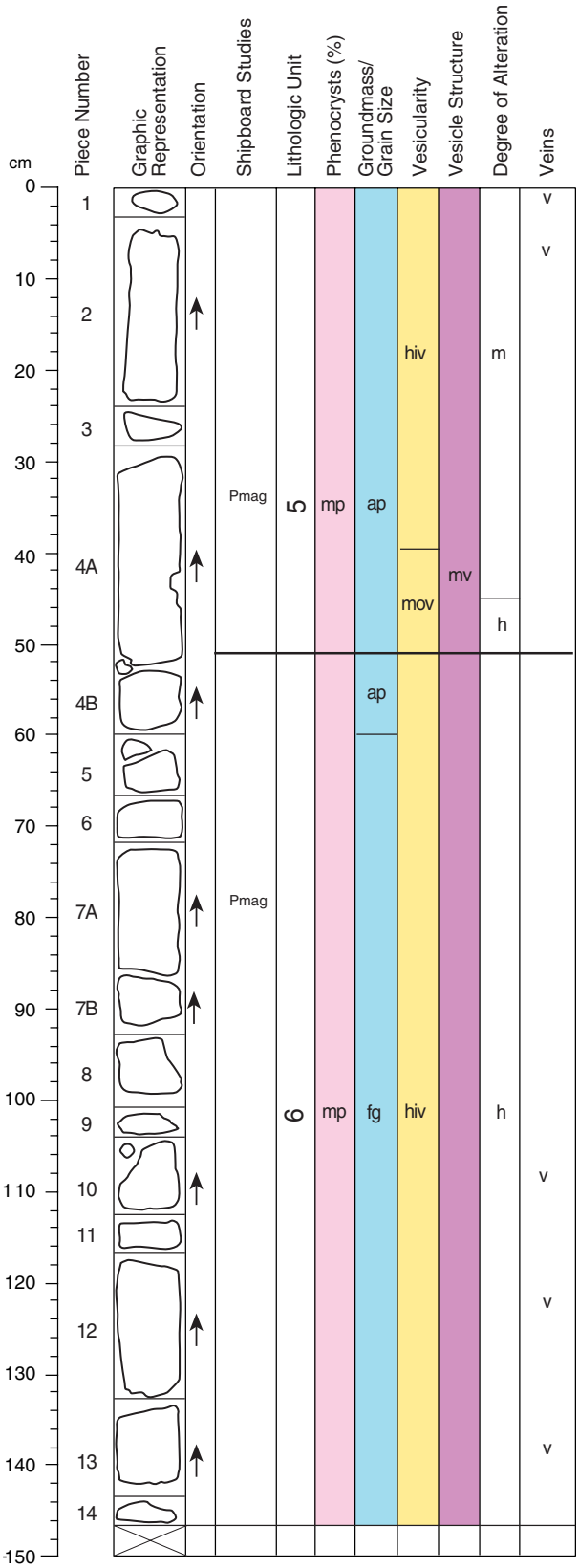
ALTERATION: Moderate to high. Highly altered in brecciated region. The breccia is cemented with carbonate and green clay. Plagioclase is partially altered and has a vitreous green color. Olivine is completely altered and replaced by Fe oxyhydroxide and green clay. Iddingsite is developed at rims and along fractures. The flow foliation is highlighted by alteration of glass to Fe oxyhydroxide and green clay.

VEINS/FRACTURES: Sparsely veined. Veins are present on the side of Pieces 1 and 2A and are filled with white carbonate and green clay.

COMMENTS: The brecciated region contains clasts (0.1-2.5 cm) of the basalt in Unit 5.
Sparse vesicles are elongated parallel to flow foliation in Pieces 1-3. A megavesicle is present on the outer core surface close to the basalt-breccia boundary at 43 cm and is lined with green clay.

(Continued on next page)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-1 (Continued)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 4A-14

CONTACTS: The contact between Units 5 and 6 is present in Piece 4A at 51 cm, based on a change from brecciated to coherent basalt and a change in phenocryst content.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5-7	1.2	0.2	0.8	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic to fine grained. The groundmass consists of plagioclase, clinopyroxene, and altered glass in an intergranular texture

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	25-40	See Comment	Irregular

COLOR: Pale red (10R 6/2) to grayish red (5R 4/2).

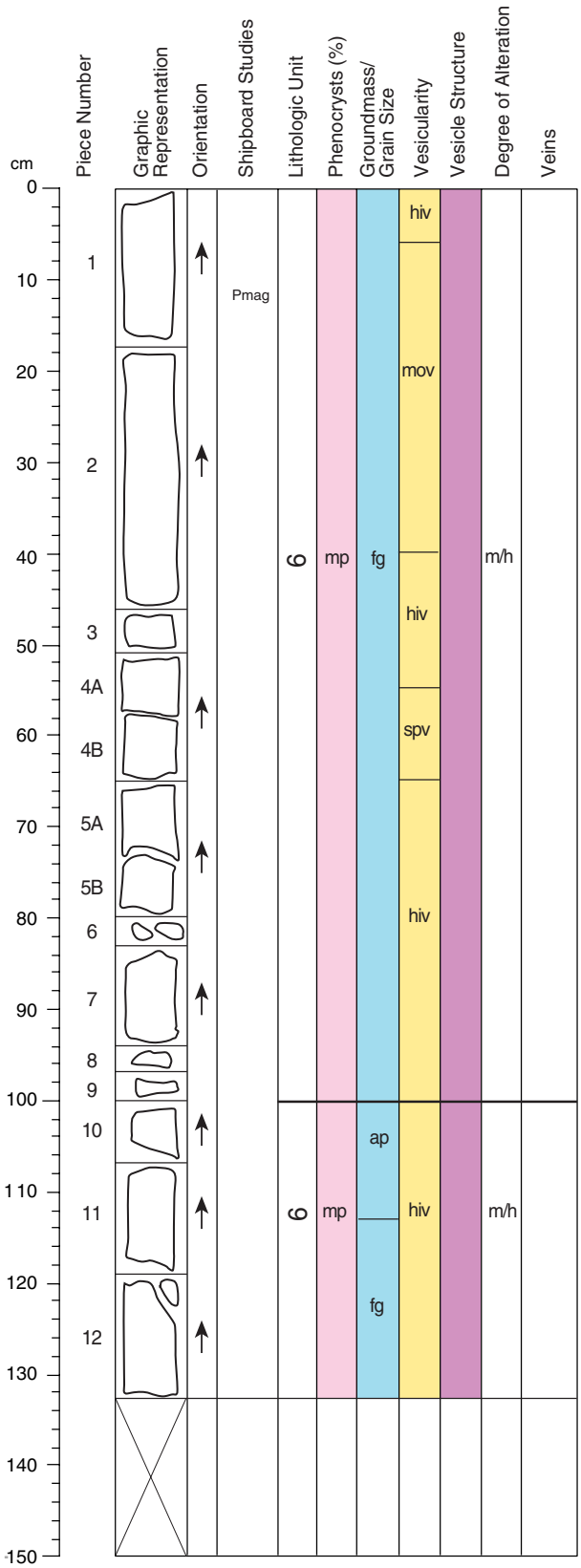
STRUCTURE: Vesicular.

ALTERATION: High. Fe-oxyhydroxide is pervasive and replaces olivine, clinopyroxene, and mesostasis. Olivine is also replaced by green clay. Some vesicles are filled with white carbonate, but are generally unfilled and lined with Fe-oxyhydroxide and pale blue-green clay.

VEINS/FRACTURES: Sparsely veined. Veins are present at the top of Pieces 12 and 13, and on the outer core surface of Piece 10. They are <0.1-0.2 mm wide and are filled with white carbonate and green clay.

COMMENTS: Vesicle size increases from Piece 4B (round, 0.5 mm) to Pieces 12-14 (elongate and irregular, 3-5 mm). Olivine is seriate between microphenocryst and phenocryst. The groundmass has grown to the same size as the olivine microphenocrysts in the fine-grained regions.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-2 (Section top: 134.67 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-12B

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	8	2.5	0.2	1	Euhedral; equant
Plagioclase	<1	1	0.5	0.5	Subhedral

GROUNDMASS: Fine grained, aphanitic next to the lobe boundary. The groundmass consists of plagioclase, clinopyroxene, and altered glass.

VESICLES:

% Mode	Size (mm): Average	Shape
3-40	1	Irregular and round

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

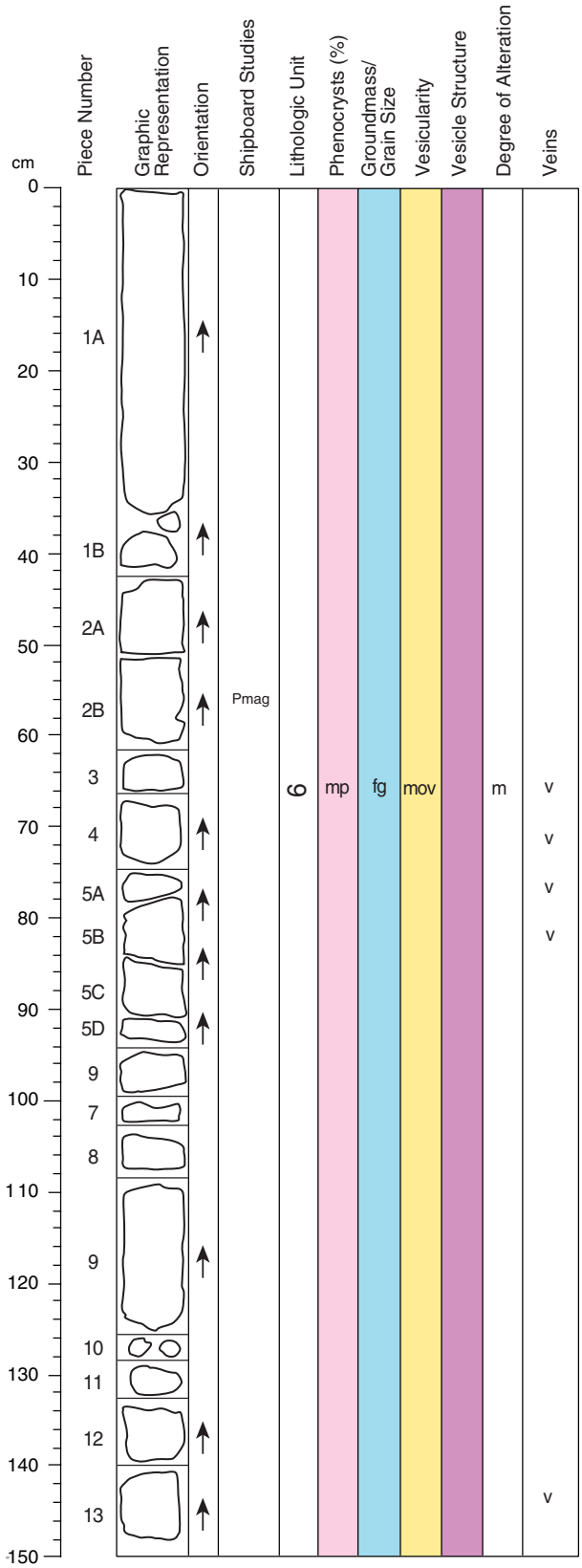
STRUCTURE: Lobed and vesicular.

ALTERATION: Moderate to high. Olivine is completely altered and replaced by Fe oxyhydroxide, iddingsite and sometimes green clay. Celadonite and Fe oxyhydroxide are present in the groundmass. Vesicles are lined or filled with celadonite and carbonate.

VEINS/FRACTURES: None.

COMMENTS: Vesicularity is variable in the section. A horizontal vesicle sheet is present in Piece 2. A lobe boundary is inferred to be present between Pieces 9 and 10 based on changes in vesicularity.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-3 (Section top: 135.99 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5	0.8	0.2	0.5	Euhedral to subhedral; equant

GROUNDMASS: Fine grained. The groundmass contains olivine (altered to Fe-oxyhydroxide), plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	10-20	1-4	Round to irregular

COLOR: Medium dark gray (N5).

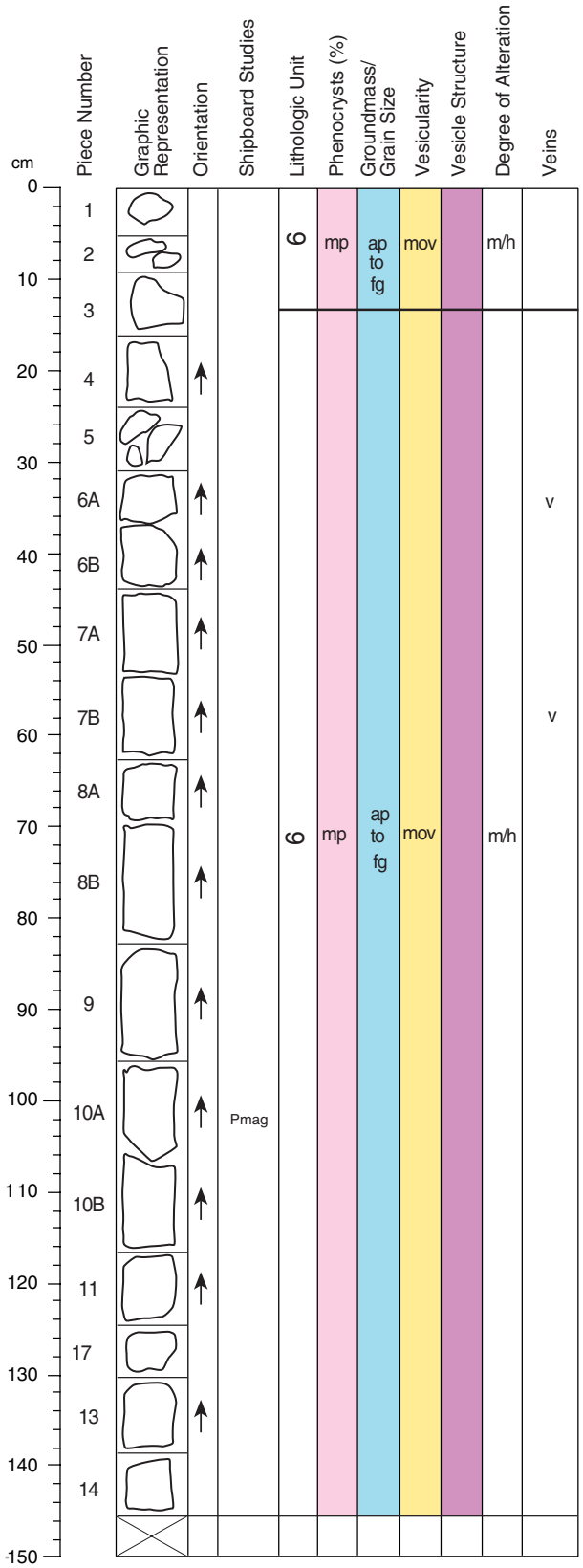
STRUCTURE: Vesicular.

ALTERATION: Moderate. Groundmass olivine is completely replaced by carbonate, green-gray clay and Fe oxyhydroxide. Vesicles are partially filled with carbonate and green-gray clay or filled with carbonate.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, ≤4 mm wide, and filled or partly filled with carbonate.

COMMENTS: Vesicles are most abundant from 0-30 cm and 130-150 cm, and are larger from 45-85 cm. Olivine is seriate between microphenocryst and phenocryst. The groundmass olivine has grown to the same size as the microphenocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-4 (Section top: 137.49 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-14

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5	0.8	0.2	0.5	Euhedral to subhedral; equant

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
0-63 cm and 117-145 cm Moderately vesicular	10-15	4	Round
63-117 cm Moderately vesicular	5-10	8	Round

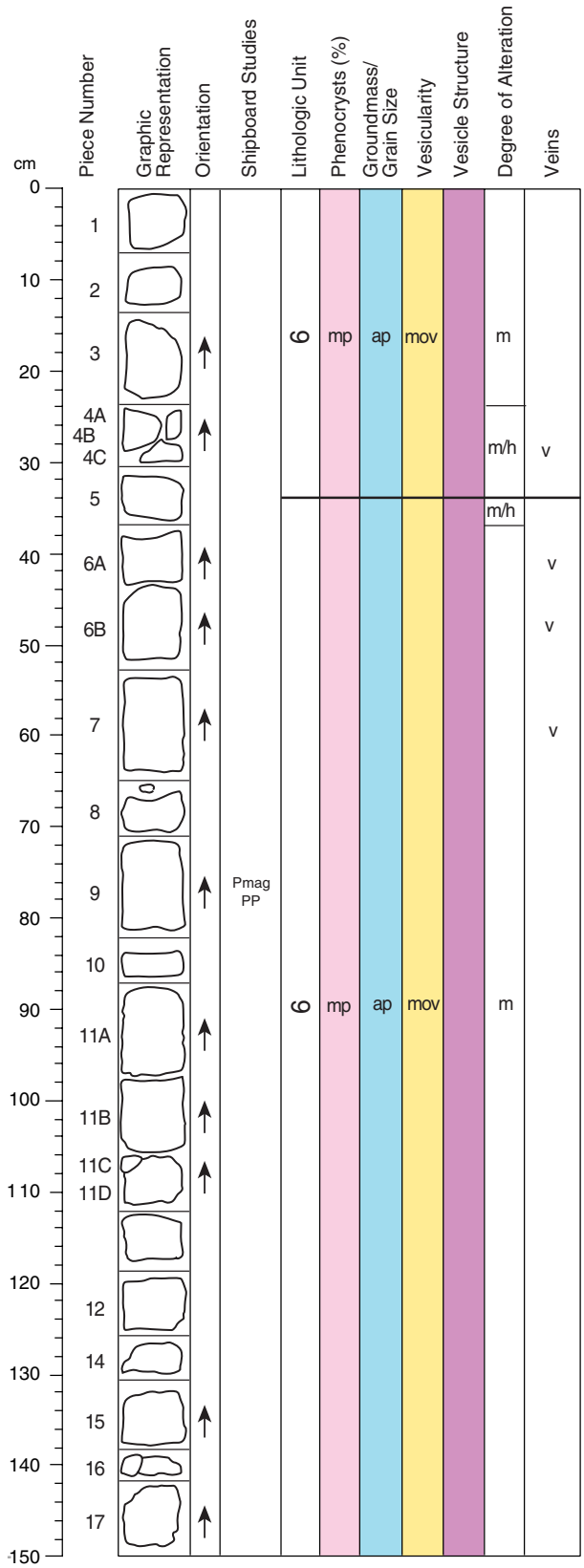
COLOR: Medium dark gray (N4).

STRUCTURE: Vesicular, lobed. There is a lobe boundary in Piece 3 at 13 cm, based on changes in vesicularity.

ALTERATION: Moderate to high. Olivine microphenocrysts are completely replaced by carbonate, green-gray clay and Fe oxyhydroxide. Vesicles are partially filled with carbonate and green-gray clay.

VEINS/FRACTURES: Sparsely veined. Veins occur in Pieces 6A, 7B. They are 0.5-2 mm wide, and filled with carbonate.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-5 (Section top: 138.94 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-17

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	8	1	0.2	0.5	Subhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	5-15	3	Round to irregular

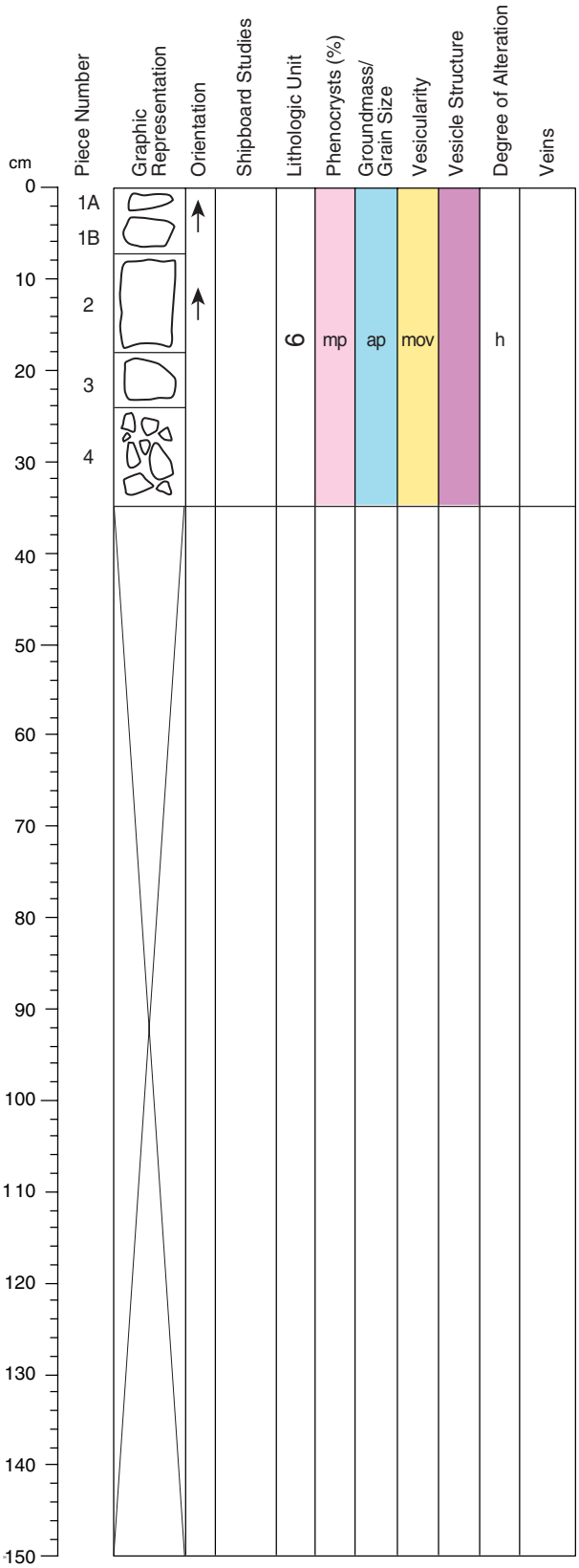
COLOR: Dark gray (N3).

STRUCTURE: Vesicular, lobed. Lobe boundary in Piece 5 is marked by a cryptocrystalline region and fragment of red clay.

ALTERATION: Moderate to high. Olivine microphenocrysts are completely replaced by green gray clay and Fe oxyhydroxide. Vesicles are partially filled with carbonate and green-gray clay.

VEINS/FRACTURES: Sparsely veined. Veins/fractures occur in Pieces 4 to 7, are <2 mm wide, and filled with carbonate and angular rock fragments.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-16R-6 (Section top: 140.44 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	8	1.5	<0.5	0.7	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	15	2	Irregular

COLOR: Dark gray (N3).

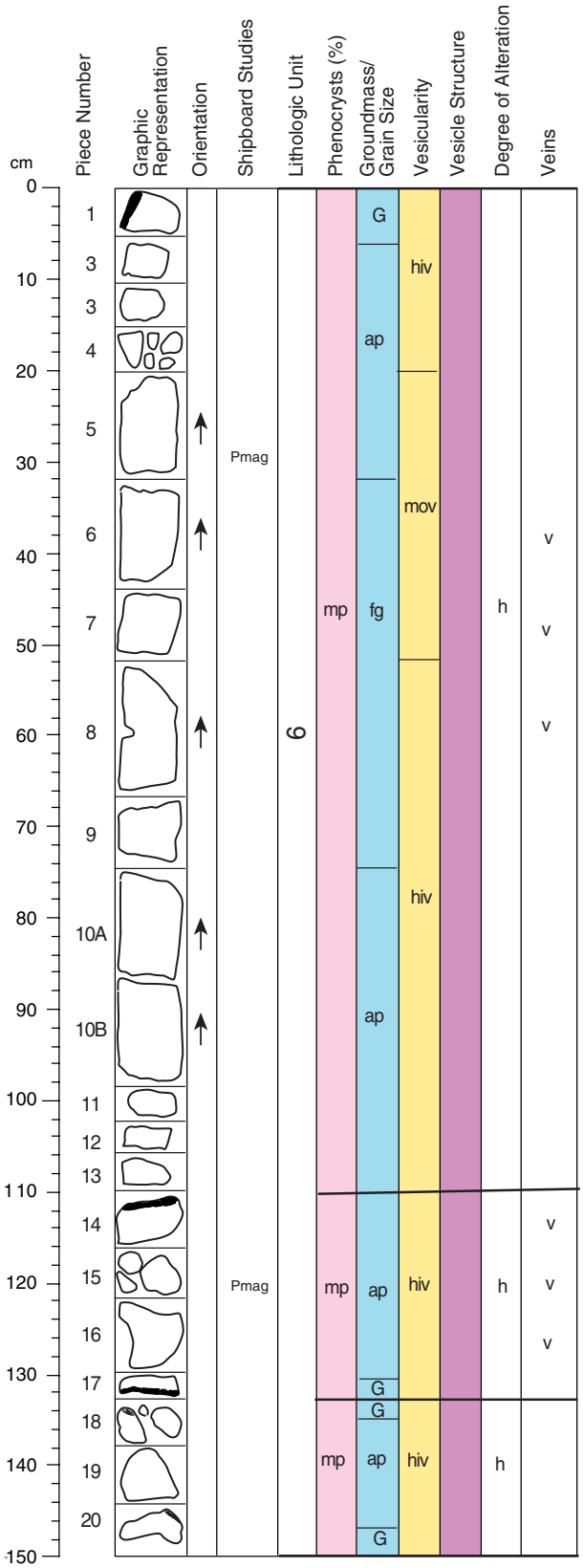
STRUCTURE: Vesicular.

ALTERATION: High. Olivine microphenocrysts are completely altered to carbonate, green-gray clay and Fe oxyhydroxide. Vesicles are partially filled with carbonate and green-gray clay.

VEINS/FRACTURES: None.

COMMENTS: There are two size populations of olivine phenocrysts; larger (1-2 mm), euhedral phenocrysts, and smaller subhedral microphenocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-17R-1 (Section top: 142.8 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-20

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5-10	1.5	0.4	0.6	Euhedral to subhedral; equant

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides in an intergranular texture.

VESICLES:		% Mode	Size (mm): Average	Shape
Piece 1-3	Highly vesicular	30-40	0.5	Round
Piece 4	Highly vesicular	25-30	4	Irregular
Pieces 5-7	Moderately vesicular	5-15	4	Round to irregular
Pieces 8-9	Highly vesicular	25-35	2	Round
Pieces 10-20	Highly vesicular	30-45	0.5	Round

COLOR: Pale brown (5YR 5/2), pale yellowish brown (10YR 6/2), moderate yellowish brown (10YR 5/4).

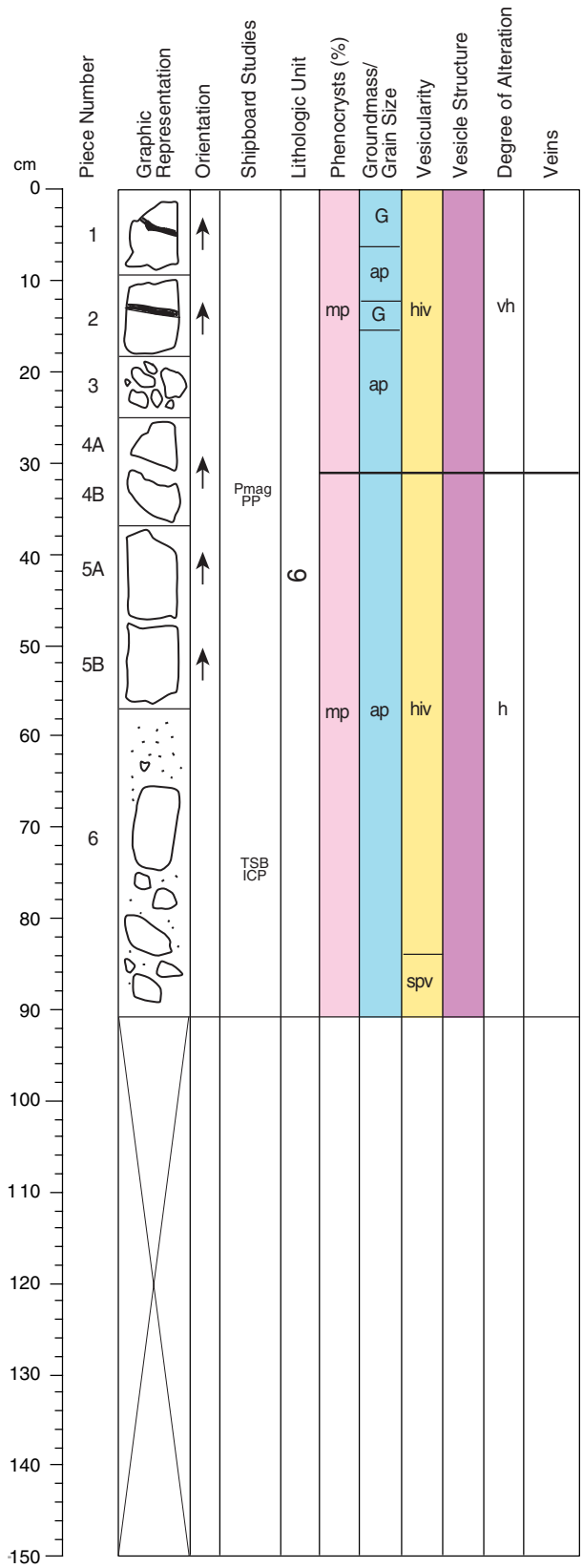
STRUCTURE: Lobed. Lobed character defined on the basis of changes in vesicularity.

ALTERATION: High. Fe-oxyhydroxide is pervasive. Vesicles are filled with white carbonate, green clay, and Fe-oxyhydroxide. Olivine is altered to Fe-oxyhydroxide and is a darker color than the altered clinopyroxene and mesostasis.

VEINS/FRACTURES: Sparsely veined. Veins are <0.1-8 mm wide and filled with white carbonate that has been stained by Fe-oxyhydroxide. The core has broken along veins.

COMMENTS: Lobe boundaries are present in Pieces 14, 17, 18, and 20 indicated by the presence of small, completely altered glassy lobe margins. The vein in Piece 8 at 61-63 cm contains voids and completely altered basalt fragments. Olivine is seriate between microphenocrysts and phenocrysts. The groundmass in the fine grained regions has grown to the same size as the microphenocrysts. There is an uneven distribution of olivine between the lobe margins and interior.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-17R-2 (Section top: 144.3 mbsf)

UNIT 6: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5-8	2.5	0.3	0.8	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:

% Mode	Size (mm): Average	Shape
2-35	0.5	Round to irregular

COLOR: Light bluish gray (5B 7/1), moderate yellowish brown (10YR 5/4), grayish brown (5YR 3/2).

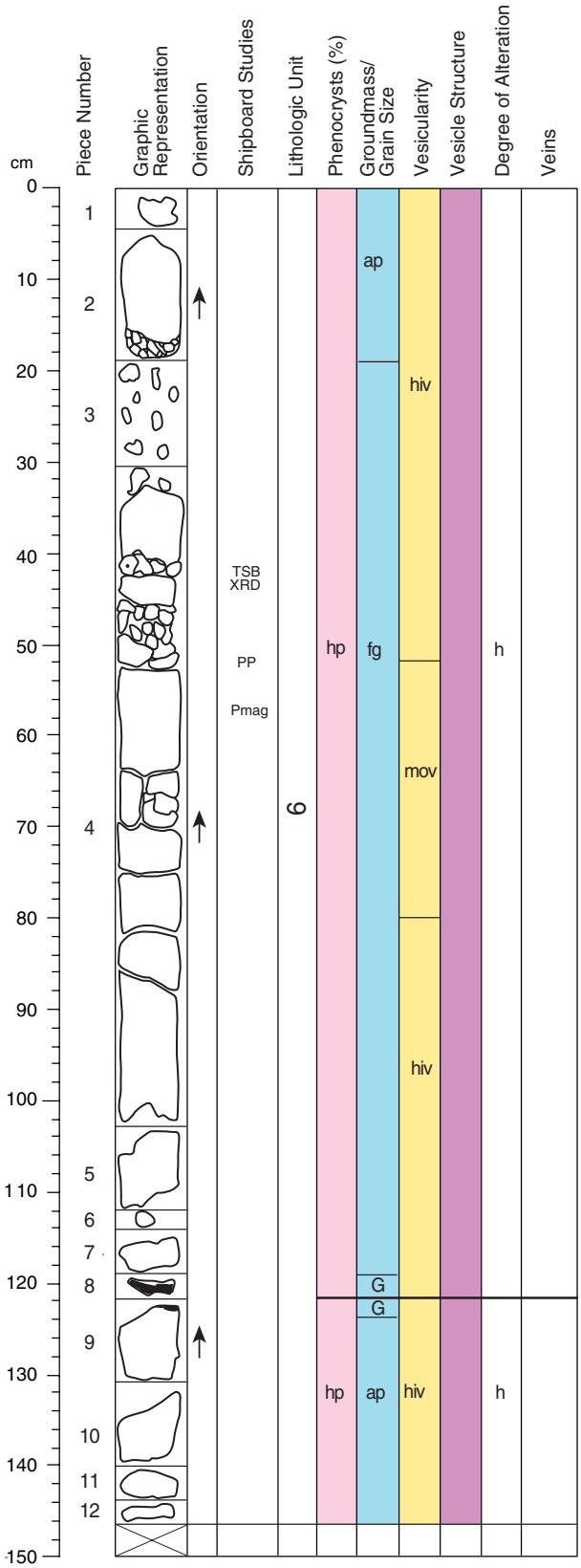
STRUCTURE: Brecciated - lobe contact? (Pieces 1-4A). Vesicular.

ALTERATION: High to very high. Fe oxyhydroxide is pervasive. Vesicles are filled with white carbonate. White carbonate also forms the cement in the brecciated regions. Olivine is replaced by green clay and is highlighted by Fe oxyhydroxide/iddingsite around rims and along fractures.

VEINS/FRACTURES: None.

COMMENTS: Piece 6 consists of many fragments, some of which are gray and sparsely vesicular. In these pieces, olivine is replaced by dark green clay. Pieces 1-4A are brecciated containing basalt clasts of the same lithology as the Unit 6 basalt and is interpreted as a brecciated lobe margin within Unit 6. Different colors are produced by different degrees of alteration.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-18R-1 (Section top: 152.4 mbsf)

UNIT 6: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	10-20	10	0.5	4	Euhedral

GROUNDMASS: Aphanitic to fine grained. The groundmass contains plagioclase and clinopyroxene in an intergranular texture.

VESICLES:		% Mode	Size (mm): Average	Shape
5-52 cm	Highly vesicular	20-30	6	Round
52-80 cm	Moderately vesicular	5-10	3	Round to elongate
80-148 cm	Highly vesicular	20-35	0.5	Round to elongate

COLOR: Medium light gray (N6), light gray (N7), dark gray (N3). Dark reddish brown (10R 3/4) in Piece 1.

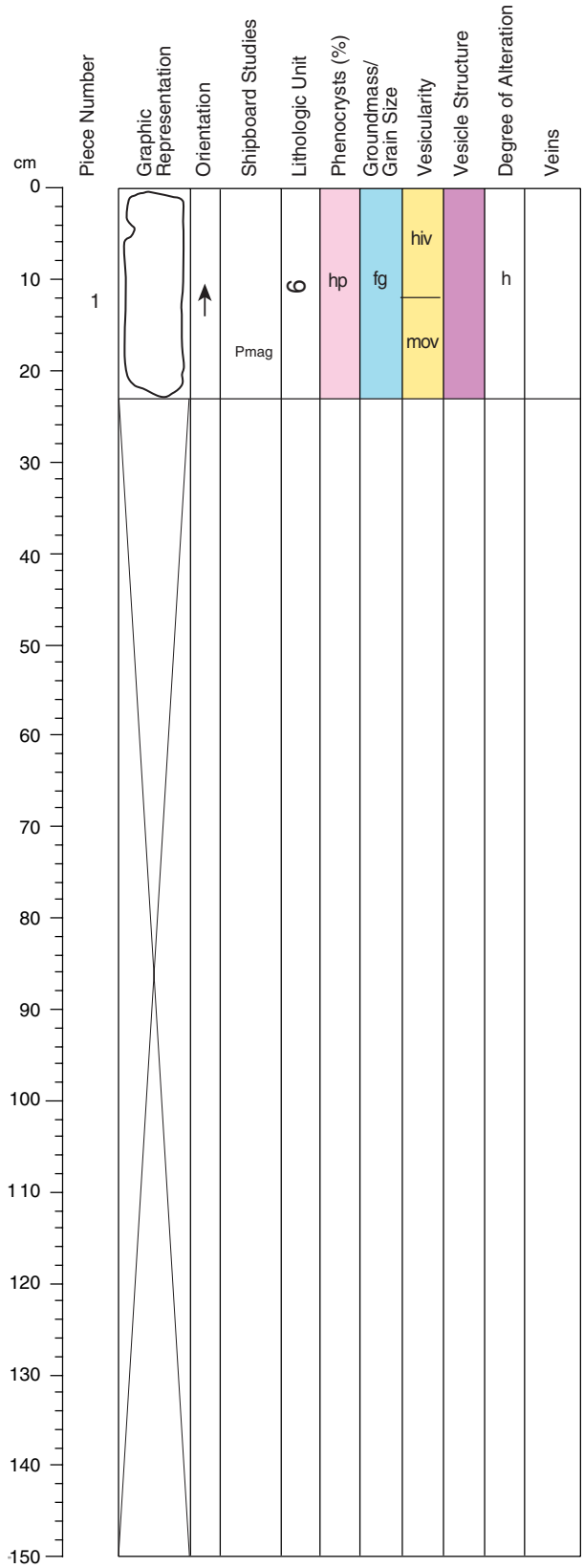
STRUCTURE: Lobed and vesicular.

ALTERATION: High. Vesicles are filled with pale green clay and white carbonate. There is an increase in Fe oxyhydroxide at the base of Piece 4. Olivine is replaced by green clay with Fe oxyhydroxide or iddingsite highlighting rims and fractures.

VEINS/FRACTURES: None.

COMMENTS: The amount of olivine has increased from Core 17R, but we see no evidence for a unit boundary so this is interpreted as an olivine-rich part of Unit 6. Pieces 2-4 were all one piece. Sawing made the pale green clay in the vesicles expand and fragment the rock. Piece 1 is an oxidized and brecciated part of a lobe margin with white carbonate cement, and is probably a dropstone. Unaltered olivine, with Fe oxyhydroxide or iddingsite highlighting rims, is present in Piece 4 and contains Cr-spinel inclusions. Piece 8 contains glass so a lobe boundary is inferred at 122 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-18R-2 (Section top: 153.87 mbsf)

UNIT 6: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	10-15	6.5	0.5	4	Euhedral

GROUNDMASS: Fine grained. The groundmass contains plagioclase and clinopyroxene in an intergranular texture.

VESICLES:

		% Mode	Size (mm): Average	Shape
0-12 cm	Highly vesicular	25-35	2	Subround to irregular
12-21 cm	Moderately vesicular	15-20	5	Subround to irregular

COLOR: Medium gray (N5) to greenish gray (5G 6/1).

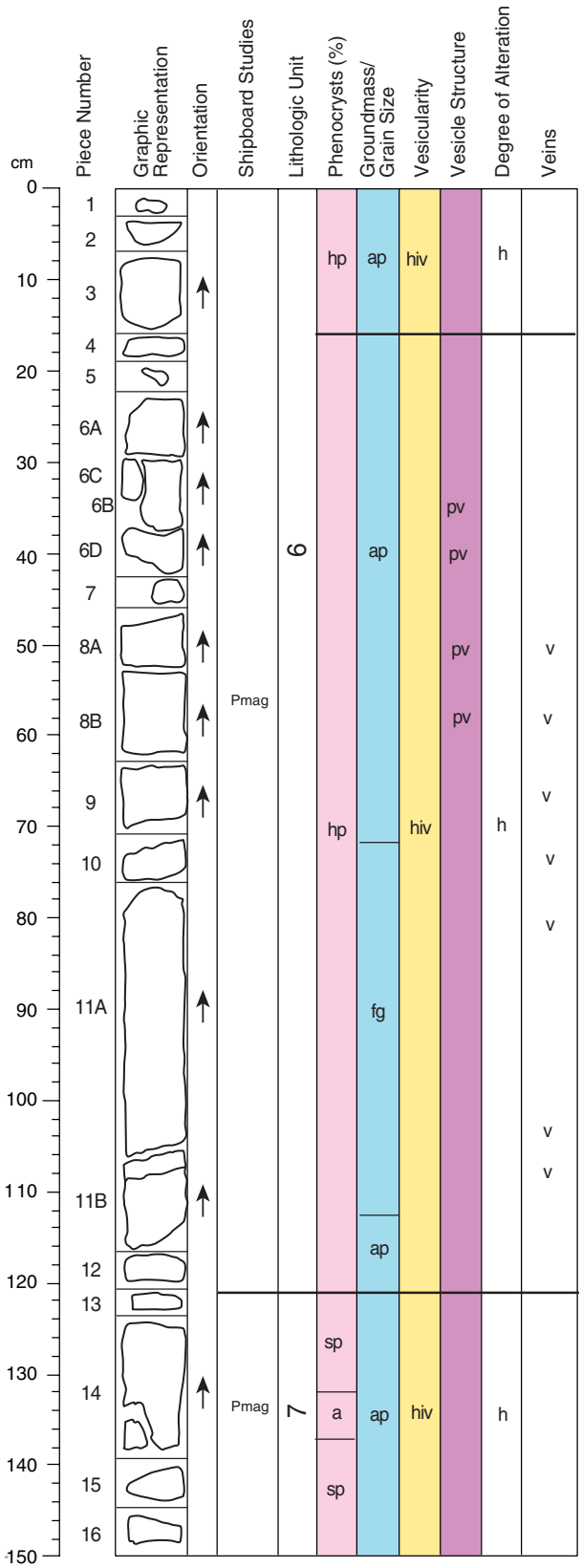
STRUCTURE: Vesicular.

ALTERATION: High. Green clay is pervasive. Vesicles are filled with pale blue-green clay, that expands when wet, and zeolites. Olivine is replaced by green clay with Fe oxyhydroxide or iddingsite highlighting rims and fractures.

VEINS/FRACTURES: None.

COMMENTS: The amount of olivine has increased from Core 17R, but we see no evidence for a unit boundary so this is interpreted as an olivine-rich part of Unit 6. Olivine contains Cr spinel inclusions.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-19R-1 (Section top: 153.8 mbsf)

UNIT 6: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None observed. The boundary between Units 6 and 7 is inferred to be between Pieces 12 and 13 at 121 cm based on a change in alteration and phenocryst abundance.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15-20	5.5	0.5	3	Euhedral

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase and clinopyroxene in an intergranular texture.

VESICLES:		% Mode	Size (mm): Average	Shape
3-50 cm	Highly vesicular	30-40	0.5	Round to irregular
50-63 cm	Highly vesicular	25-30	2	Round to elongate
63-106 cm	Highly vesicular	25-35	4	Round to irregular
106-121 cm	Highly vesicular	20-40	1	Round to elongate

COLOR: Medium light gray (N6), dark gray (N3), to medium bluish gray (5B 5/1).

STRUCTURE: Lobed. Defined on the basis of changes in vesicularity.

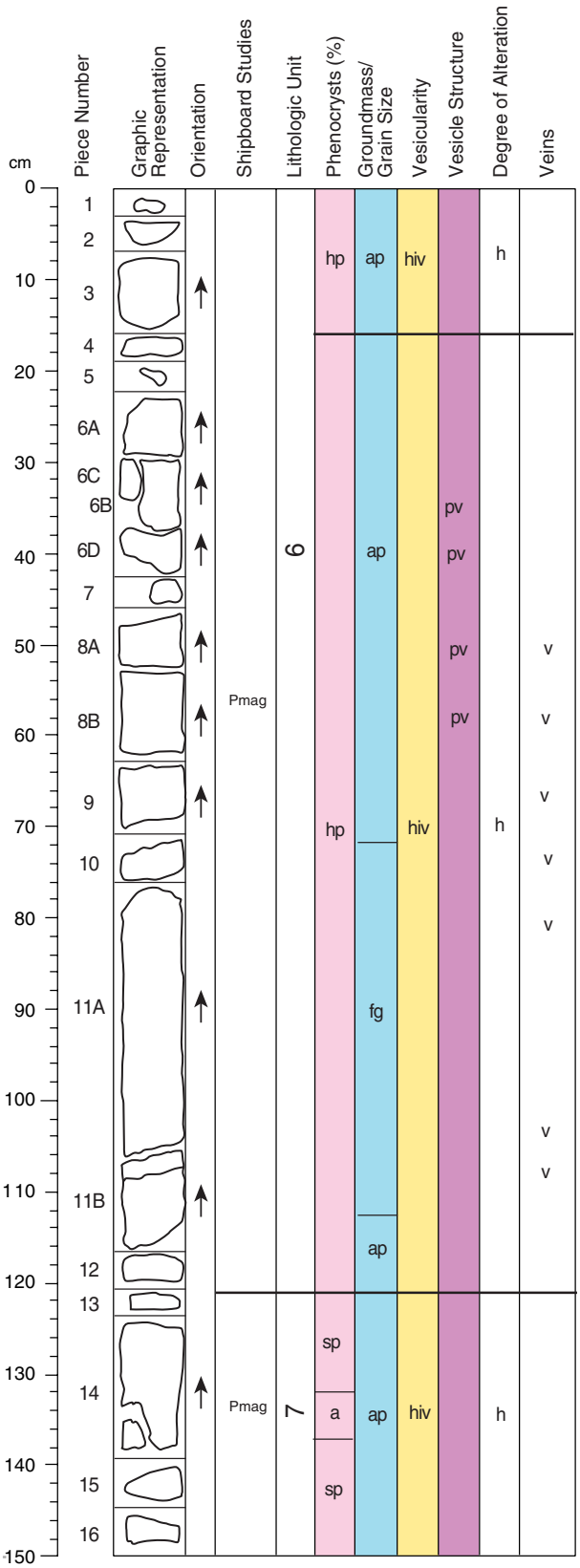
ALTERATION: High. Green clay is pervasive. Vesicles are filled with pale blue-green clay and white carbonate. Olivine is replaced by green clay with Fe oxyhydroxide or iddingsite highlighting rims and fractures. Clinopyroxene is replaced by Fe oxyhydroxide.

VEINS/FRACTURES: Sparsely veined. Veins are <0.1-0.5 mm wide and concentric with the lobe margins. They are filled with green clay and white carbonate.

COMMENTS: Piece 1 is a dropstone. Pipe vesicles are present in Pieces 6B, 6D, 8A, and 8B. They are filled with white carbonate and are 1-2.5 cm long. Lobe boundaries are present in Pieces 3 and 4 on the basis of changes in vesicularity and grain size. Pieces 2 and 3 may represent the lower part of the second lobe in Section 18R-2. Pieces 6A-6D and Pieces 8A-12 define small but distinct lava lobes defined on changes in vesicularity and concentric veins.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-19R-1 (Continued)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 13-16

CONTACTS: None observed. The boundary between Units 6 and 7 is inferred to be between Pieces 12 and 13 at 121 cm based on a change in alteration and phenocryst abundance.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1-2	1.2	0.2	0.4	Euhedral to subhedral; equant

GROUNDMASS: Aphanitic. The groundmass consists of plagioclase and clinopyroxene in an intergranular texture.

VESICLES:

	% Mode	Size (mm): Average	Shape
Highly elongate vesicular	30-40	2	Round to

COLOR: Grayish red (10R 4/2) to pale red (10R 6/2).

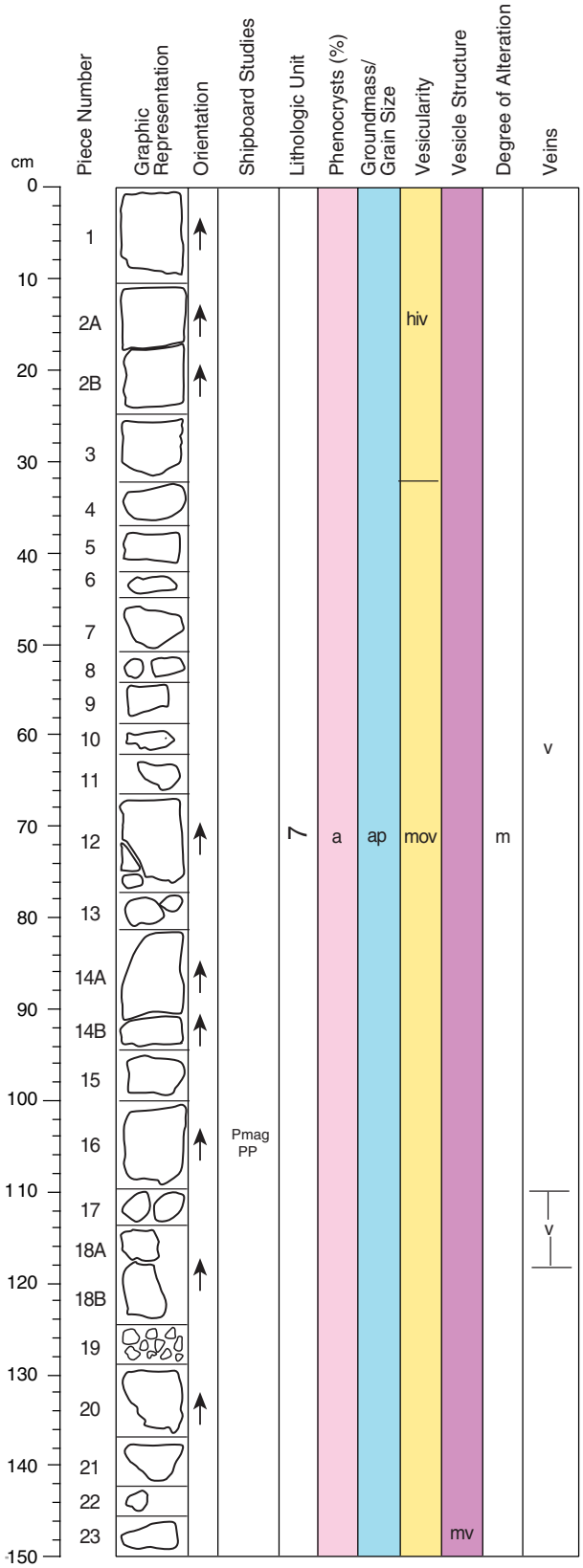
STRUCTURE: Vesicular.

ALTERATION: High. Fe oxyhydroxide is pervasive. Olivine is replaced by Fe-oxyhydroxide and dark greenish gray clay. Mesostasis and clinopyroxene is replaced by Fe oxyhydroxide. Vesicles are lined with Fe oxyhydroxide, green clay, and zeolites. Occasionally they are filled with white carbonate.

VEINS/FRACTURES: None.

COMMENTS: Olivine distribution is uneven and may be a microphenocryst phase.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-19R-2 (Section top: 155.3 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-23

CONTACTS: None.

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

GROUNDMASS: Aphanitic. The groundmass contains olivine (completely altered), plagioclase, and clinopyroxene.

VESICLES:	% Mode	Size (mm): Average	Shape
	15-35	3	Subround to irregular

COLOR: Grayish red (10R 4/2) above 60 cm grading to medium light gray (N6) below 110 cm.

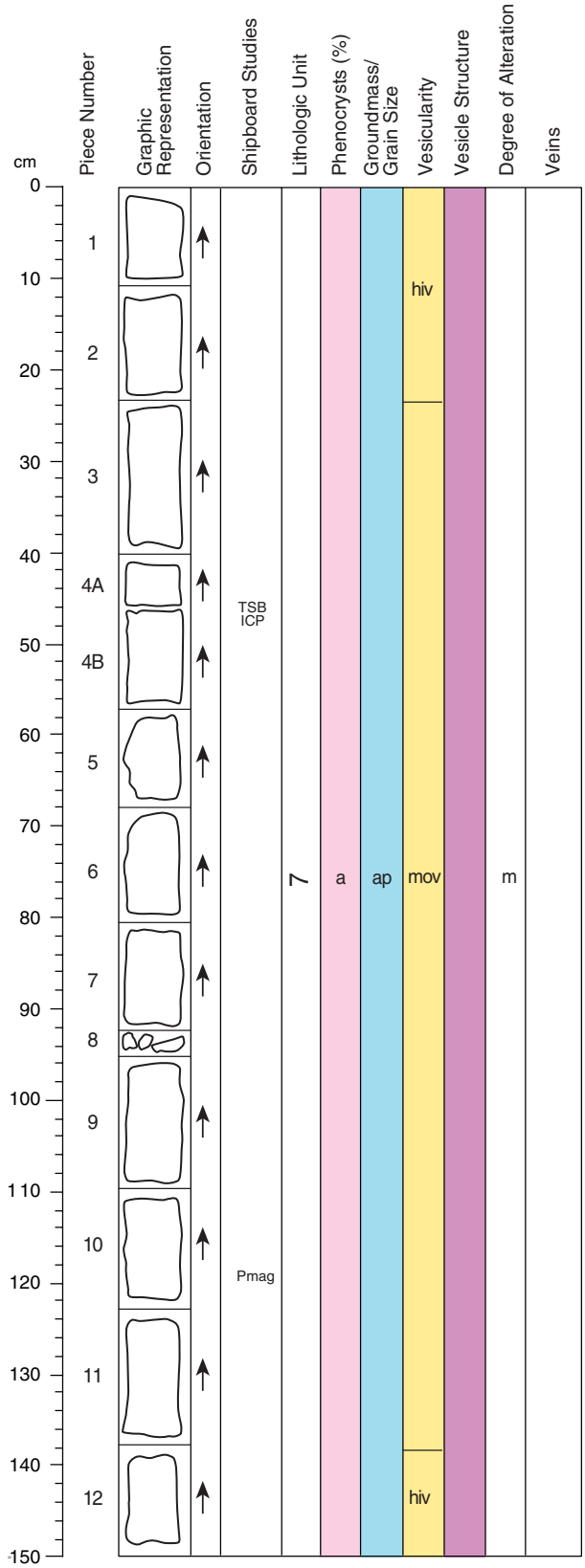
STRUCTURE: Vesicular.

ALTERATION: Moderate. Olivine is replaced by Fe oxyhydroxide and dark greenish gray clay (proportion of Fe oxyhydroxide decreases down section). Groundmass mesostasis is altered to dark gray clay and Fe oxyhydroxide (proportion of Fe oxyhydroxide decreases down section). Vesicles are lined with Fe oxyhydroxide (0-60 cm only), dark greenish gray and dark bluish gray clay, and carbonate.

VEINS/FRACTURES: Sparsely veined. One vein at 63-64 cm and one at 110-118 cm are ≤4 mm wide and filled with carbonate and Fe oxyhydroxide.

COMMENTS: Vesicle size increases and abundance decreases down section. The high vesicularity and reddish weathered appearance in the upper 60 cm of this section suggest that this interval, along with the bottom 29 cm of the previous section, represent the weathered flow top of this unit.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-19R-3 (Section top: 156.8 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1.5	0.5	0.7	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains olivine (completely altered), plagioclase, and clinopyroxene.

VESICLES:	% Mode	Size (mm): Average	Shape
	5-30	2	Round

COLOR: Medium light gray (N6).

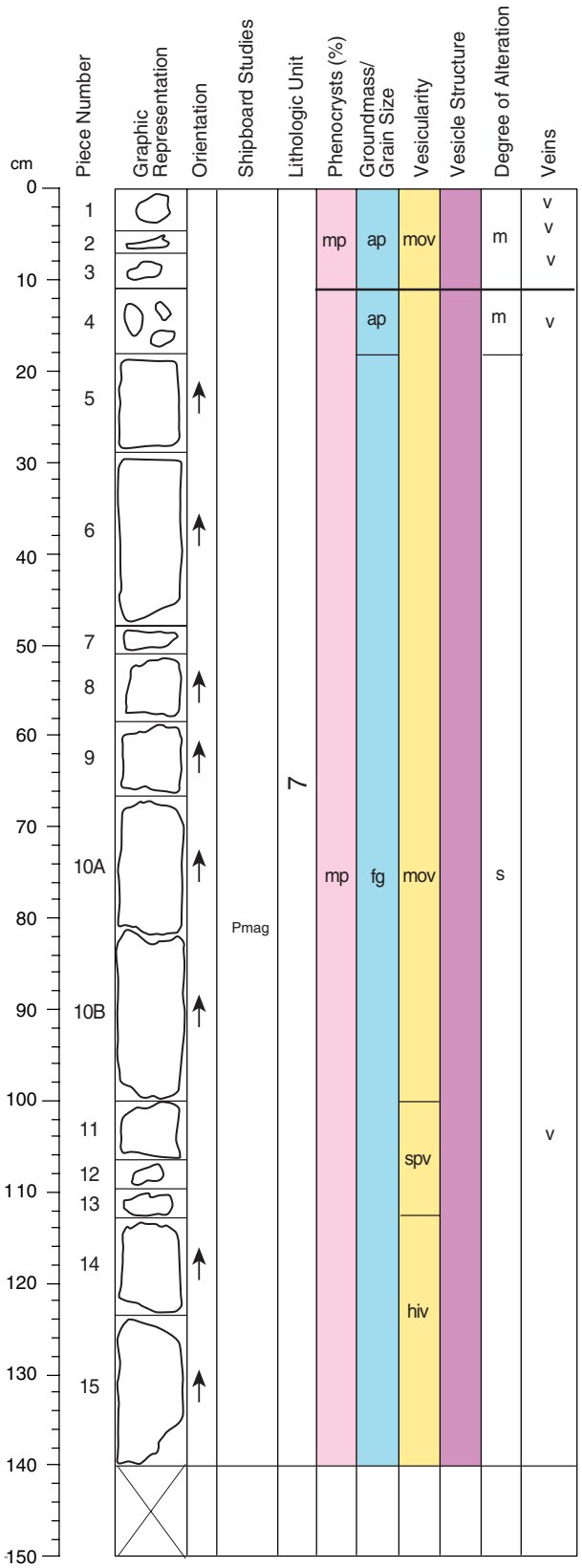
STRUCTURE: Vesicular to massive.

ALTERATION: Moderate. Olivine is replaced by Fe oxyhydroxide in Piece 1 and dark greenish gray clay in Piece 12, and a gradational mixture of the two in between. Groundmass mesostasis is altered to dark gray clay. Vesicles are lined with dark gray clay in Pieces 1-3 and the top of Piece 4 (i.e., 0-45 cm), and dark bluish gray clay below 45 cm.

VEINS/FRACTURES: None.

COMMENTS: Vesicles are most abundant in Pieces 1, 2, and 12 grading to least abundant in Pieces 5-7.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-20R-1 (Section top: 162.2 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3-4	0.5	0.15	0.1	Euhedral; microphenocryst
Clinopyroxene:	1	0.8	0.2	0.5	Euhedral; equant

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase, clinopyroxene black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
10-18 cm	7-10	3	Round
18-48 cm	18	5	Round to irregular
48-67 cm	8	8	Irregular
67-100 cm	12	2	Irregular
100-112 cm	4	2	Round
112-140 cm	20	2	Round

COLOR: Medium light gray (N6). Grayish red purple (5 RP 4/2) in moderately altered regions.

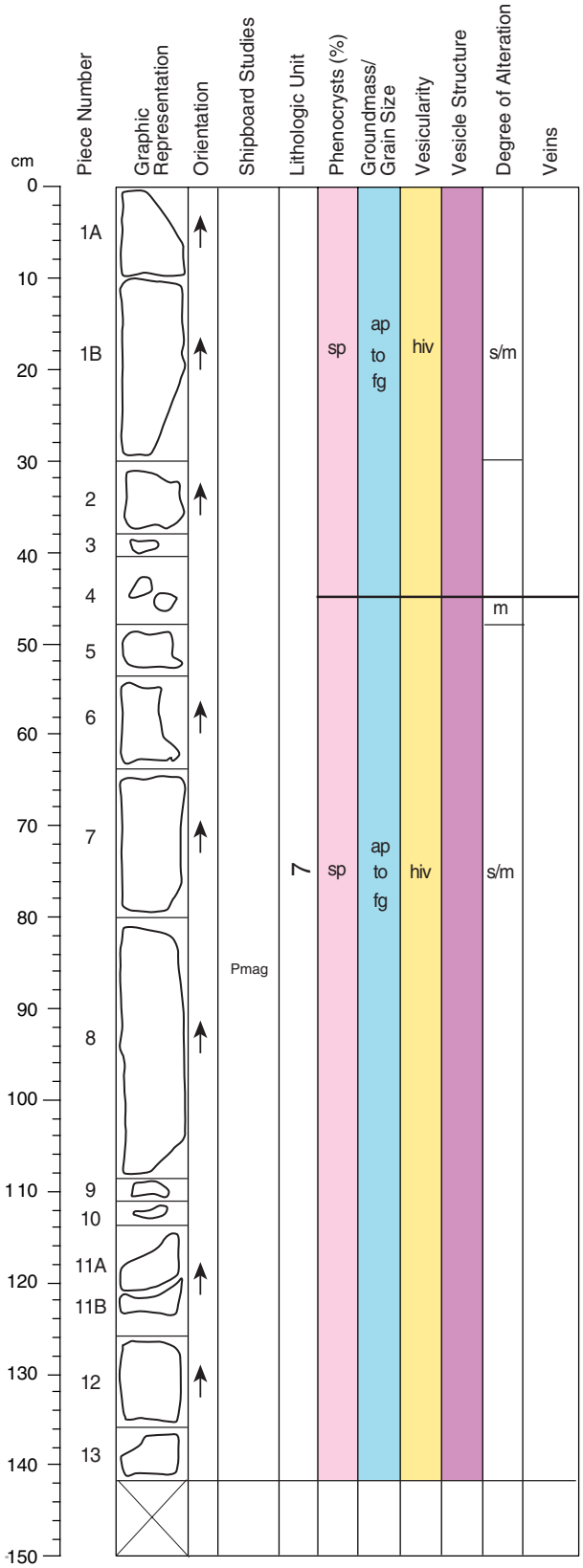
STRUCTURE: Vesicular and lobed. Lobe margin is inferred to be between Pieces 3 and 4 based on changes in grain size and vesicularity.

ALTERATION: Slight to moderate. Most olivine phenocrysts are rimmed with Fe oxyhydroxide and replaced with green clay. Microphenocysts below Piece 4 appear much less altered. Vesicles are empty or filled with celadonite or white carbonate between 80-100 cm. Some vesicles contain zeolite.

VEINS/FRACTURES: Sparsely veined. <1 mm veins are present in Pieces 1-4. They contain white carbonate and small amounts of green and orange clay.

COMMENTS: Most olivine phenocrysts are of the same size as the groundmass phase, which makes it difficult to tell whether groundmass olivine is present or not.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-20R-2 (Section top: 163.61 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1.5	2	0.5	0.7	Euhedral; equant
Clinopyroxene:	<<1	1	1	1	Subhedral

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase, clinopyroxene black oxides and olivine(?).

VESICLES:	% Mode	Size (mm): Average	Shape
0-54 cm	50	1	Round to irregular
54-95 cm	50	3	Round to irregular
95-143 cm	50	5	Irregular

COLOR: Medium light gray (N6). Grayish red purple (5 RP 4/2) in moderately altered regions.

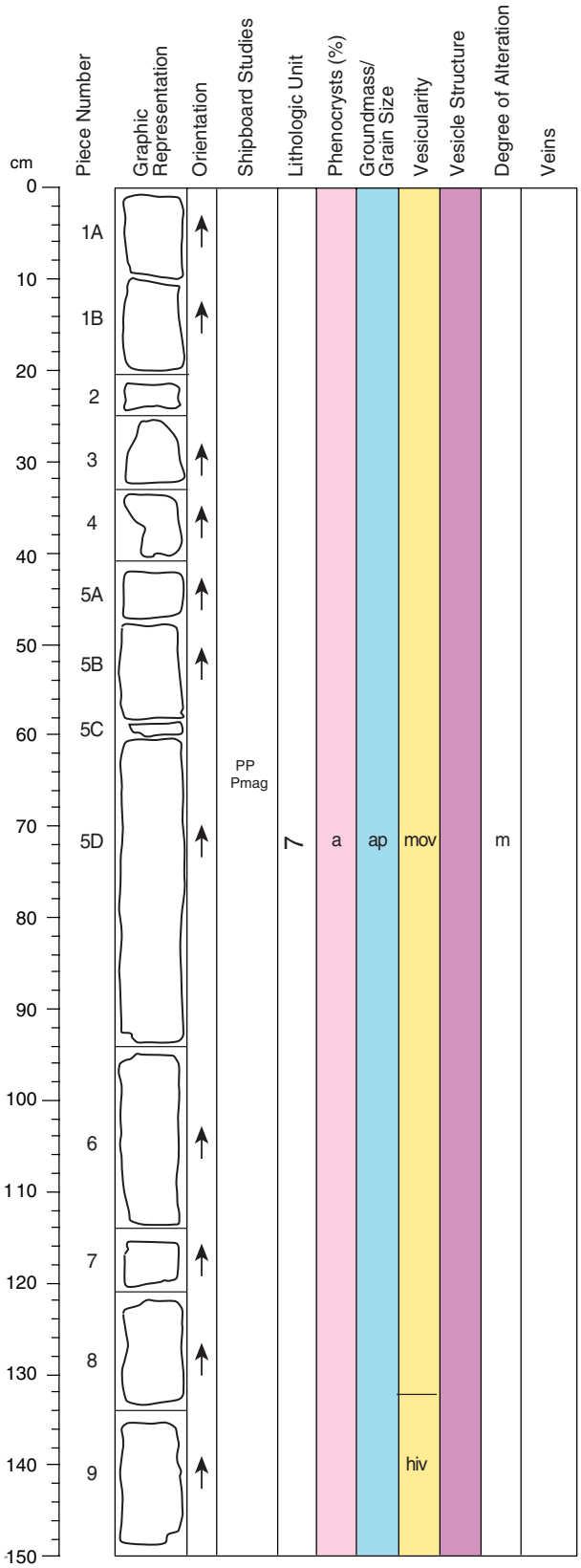
STRUCTURE: Vesicular and lobed. Lobe margin is inferred to be in Piece 4 at 45 cm, based on the change in vesicularity.

ALTERATION: Slight to moderate. Most olivine phenocrysts are replaced by Fe oxyhydroxide or dark greenish gray clay. Some olivine phenocrysts, however, are unaltered. Unaltered olivine may be present in the groundmass. 90% of the vesicles are unfilled, and the rest are lined with pale green or pale blue clay.

VEINS/FRACTURES: None.

COMMENTS: Most olivine phenocrysts are similar in size to the main groundmass phases size, which makes it difficult to tell whether groundmass olivine is present or not.
Clinopyroxene phenocrysts are usually present as glomerocrysts intergrown with olivine.
There is a decrease in vesicle size from 0 cm to 45 cm, and an increase in vesicle size from 45 cm to 143 cm. Therefore, a lobe margin is inferred at 45 cm, but no change in crystallinity or glassy margin is observed.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-20R-3 (Section top: 165.03 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

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

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
0-130 cm	5	3	Coalesced and irregular
130-150 cm	35	1.5	Round

COLOR: Medium light gray (N6).

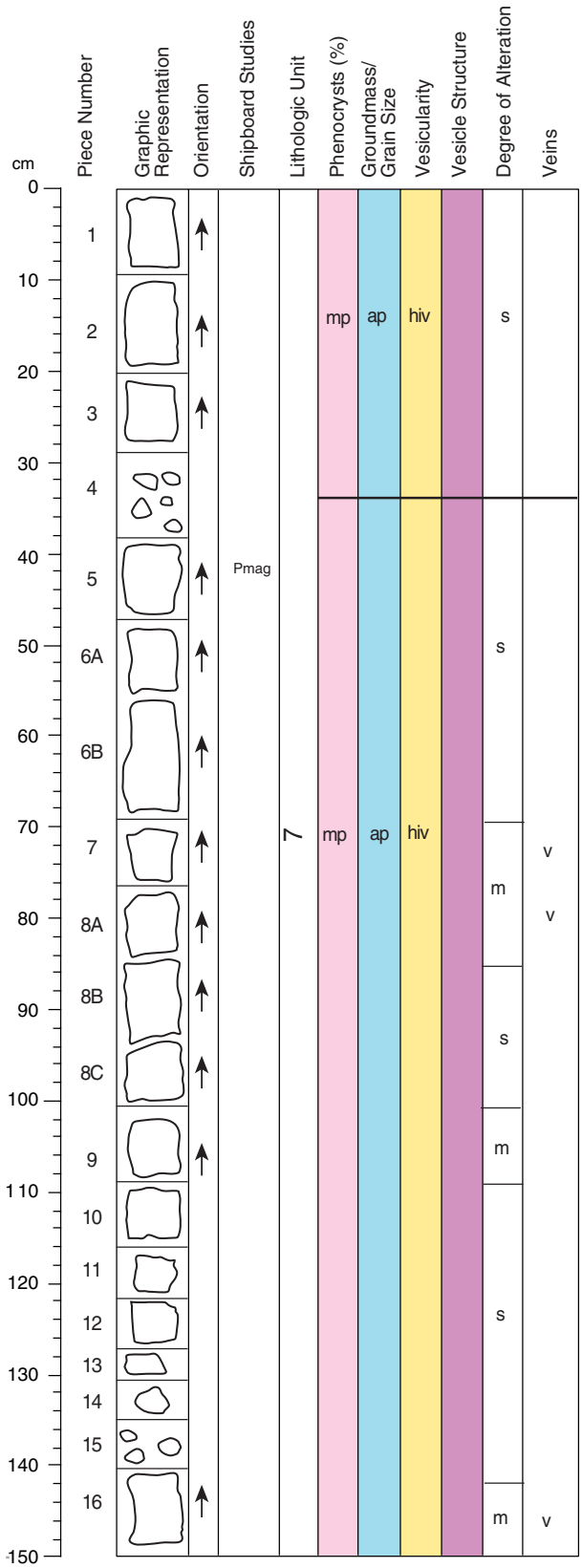
STRUCTURE: Massive interior of a vesicular lobe; no lobe margin is present in this section.

ALTERATION: Moderate. Most olivine phenocrysts are replaced by dark greenish gray clay, but in rare grains yellow green patches remain. Most vesicles are unfilled and lined with gray clay with superimposed “golden” bubbles. Dark gray altered groundmass forms streaks with a random orientation.

VEINS/FRACTURES: None.

COMMENTS: This section is moderately vesicular from 0-130 cm with relatively large (1-5 mm), coalesced and irregular vesicles. From 130-150 cm there is an abrupt transition to a highly vesicular zone with smaller (~1.5 mm) and round vesicles.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-20R-4 (Section top: 166.53 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2-3	2.5	0.5	0.7	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene and black oxides. Small amounts of pyrite are seen in Piece 1.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	35-40	2	Round

COLOR: Medium light gray (N6).

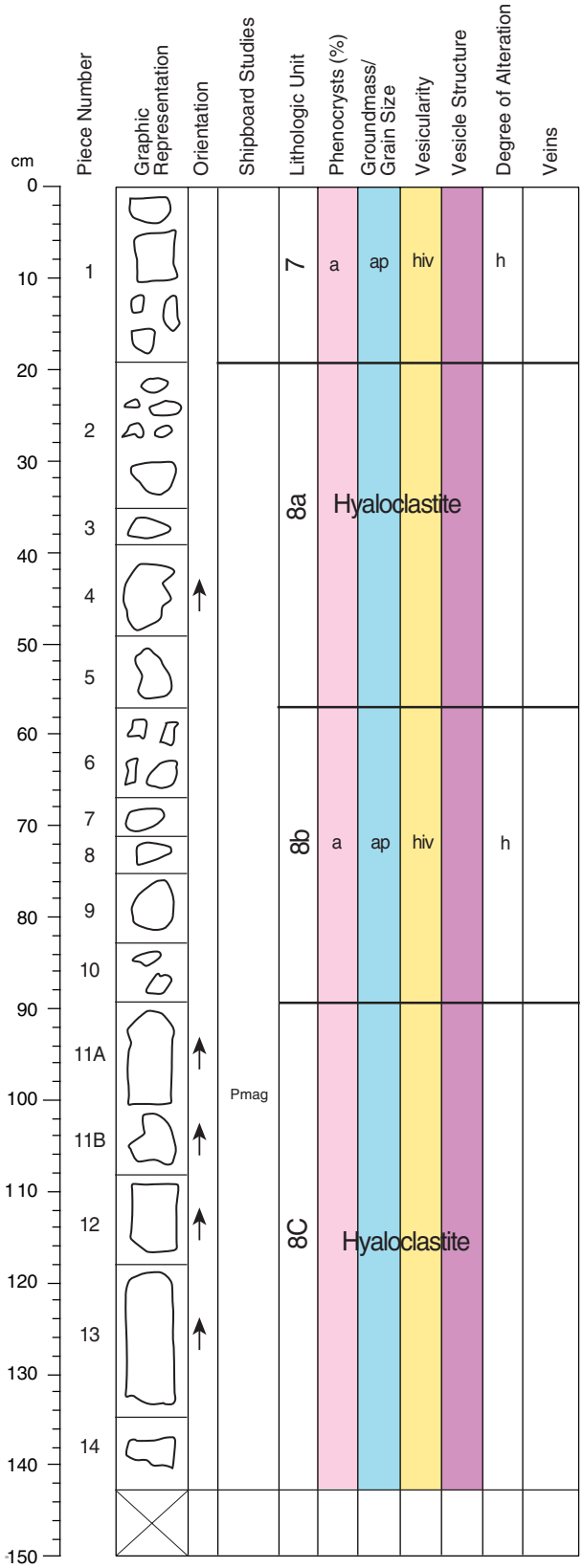
STRUCTURE: Lobed. A lobe boundary is inferred to be at 35 cm, based on changes in crystallinity. A glassy base was not recovered.

ALTERATION: Slight to moderate. Olivine is partly replaced by Fe oxyhydroxide although occasionally remains unaltered. Groundmass mesostasis is altered to dark gray clay. Vesicles are lined with dark gray clay and occasionally yellow clay. Rarely the vesicles are filled with white carbonate.

VEINS/FRACTURES: Sparsely veined. Thin (0.5 mm) white carbonate filled veins are present in Pieces 7, 8A and 16.

COMMENTS: Olivine appears to be a microphenocryst phase. Vesicle size broadly decreases from 2 mm in Piece 1 to 1 mm in Piece 4, and then increases again until the base. This suggests that there may be a lobe boundary in Piece 4, although no glass is preserved. Pieces 1-3 therefore represent the basal zone of a lobe, and Pieces 5-16 represent the vesicular upper crust of the lobe beneath.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-21R-1 (Section top: 171.8 mbsf)

UNIT 7: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None observed. The contact between the aphyric basalt of Unit 7 and the hyaloclastite of Unit 8A is inferred to be between Pieces 1 and 2.

GROUNDMASS: Aphanitic. The groundmass contains plagioclase laths, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	30	0.5	Round

COLOR: Grayish black (N2)

STRUCTURE: Vesicular.

ALTERATION: High. Vesicles are unfilled or are filled with gray clay.

VEINS/FRACTURES: None.

UNIT 8b: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 6-10

CONTACTS: None observed. The contact between the hyaloclastite of Subunits 8A and 8B is inferred to be between Pieces 5 and 6.

GROUNDMASS: Aphanitic. The groundmass contains plagioclase laths, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	30	0.5	Round

COLOR: Grayish black (N2)

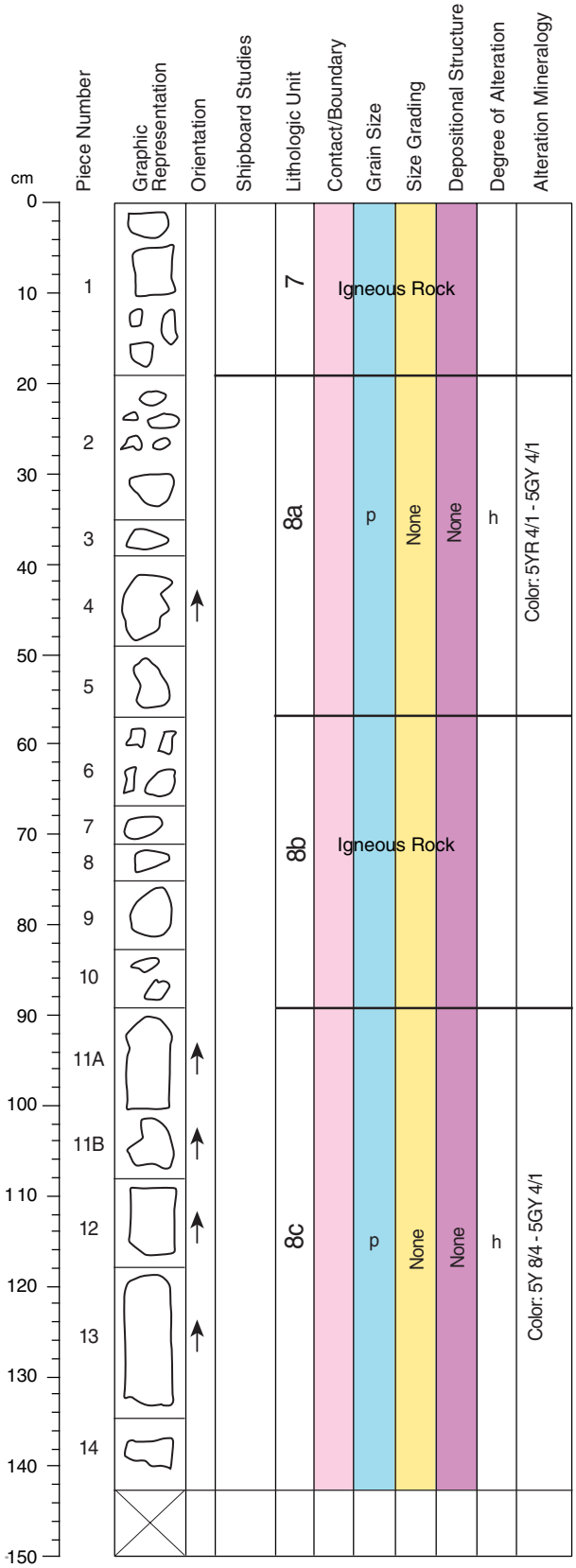
STRUCTURE: Vesicular.

ALTERATION: High. Vesicles are unfilled or are filled with carbonate, gray clay and blue green clay.

VEINS/FRACTURES: None.

COMMENTS: Pieces 6-10 may represent a large clast; there is no evidence for lobe margins.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-21R-1 (Section top: 171.8 mbsf)

UNIT 8a: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 2-5

CONTACTS: None observed. The contact between Unit 7 and Unit 8A is inferred to be between Pieces 1 and 2.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Varied. Larger (up to 30 mm) clasts are brownish gray (5YR 6/4), and the matrix is dark greenish gray (5GY 4/1).

COMPONENTS: Angular clasts of aphyric, moderately to highly vesicular basalt, up to 30 mm in width.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

UNIT 8c: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 11-14

CONTACTS: None observed. The contact between Subunits 8B and 8C is inferred to be between Pieces 10 and 11A.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

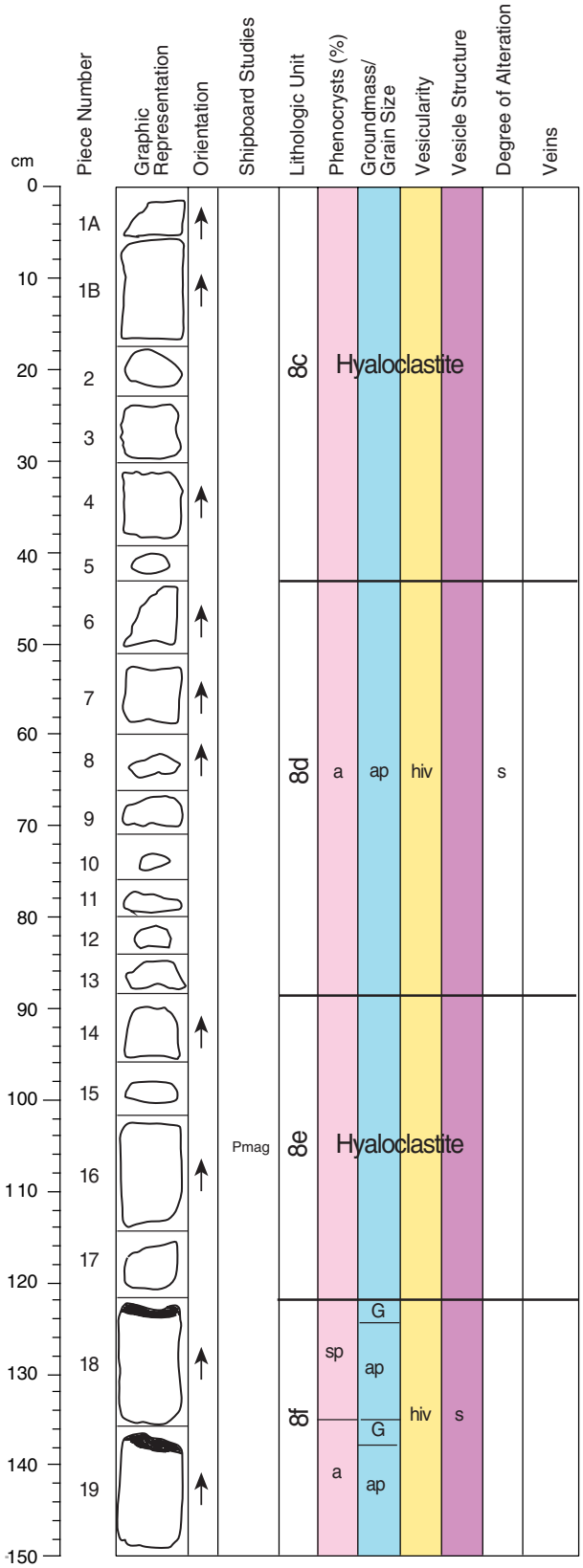
COLOR: Varied. Clasts are dominantly grayish yellow (5Y 8/4), and the matrix is dark greenish gray (5GY 4/1).

COMPONENTS: Angular clasts of moderately vesicular basalt ranging in width from 1 to 10 mm.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-21R-2 (Section top: 173.23 mbsf)

UNIT 8d: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 6-13

CONTACTS: None.

PHENOCRYSTS: Aphyric.

GROUNDMASS: Aphanitic. Contains plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	40	1	Round

COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Lobe boundary is present at 43 cm and is indicated by a glassy margin on Pieces 6 and 7.

ALTERATION: Slightly altered. Vesicles are filled (or semi-filled) with white carbonate, gray smectite, or green celadonite. Some vesicles contain round clear nodules (1 mm wide) with yellow centers.

UNIT 8f: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 18-19

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	<1	1.25	0.75	1	Euhedral; equant

GROUNDMASS: Aphanitic. Contains plagioclase laths, clinopyroxene, and glassy mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	40	1	Round

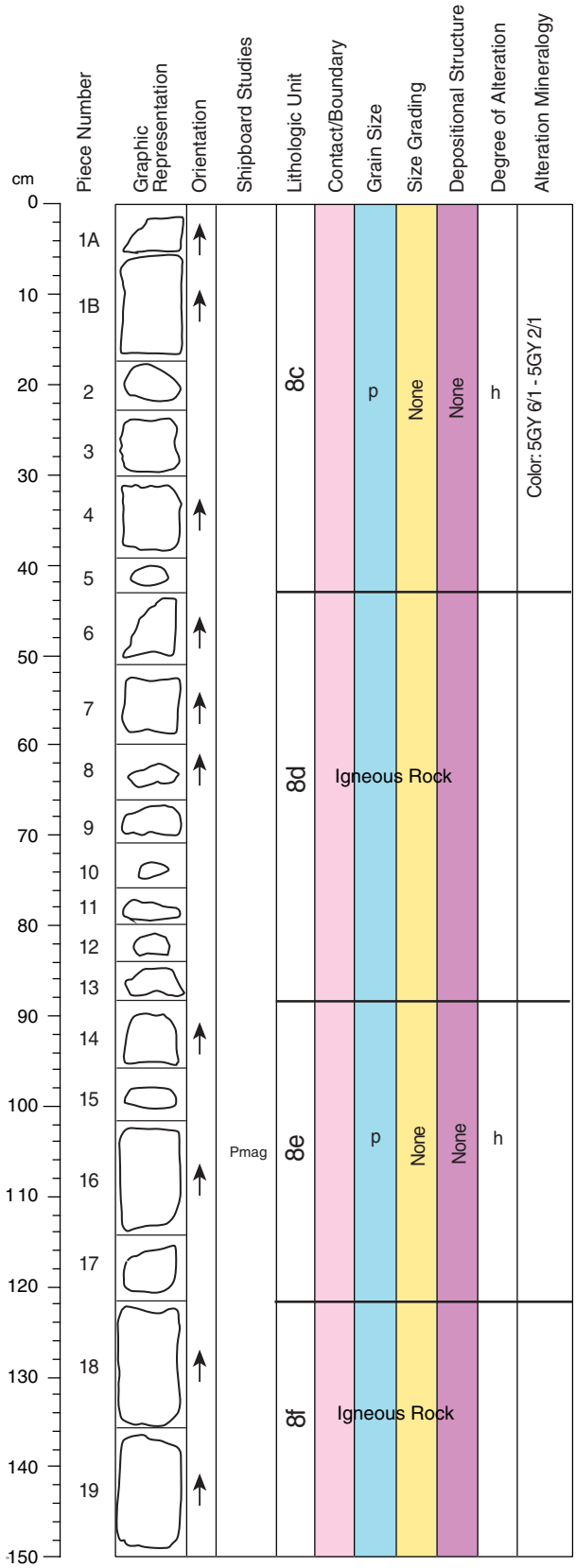
COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Lobe boundary is present at 136 cm, between Pieces 17 and 18 and is indicated by a glassy margin.

ALTERATION: Slightly altered. Vesicles are filled (or semi-filled) with white carbonate, gray smectite, or green celadonite. Some vesicles contain round clear nodules (1 mm wide) with yellow centers.

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-21R-2 (Section top: 173.23 mbsf)

UNIT 8c: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-5

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli that is cemented by zeolite.

COLOR: Greenish gray (5GY 6/1) to greenish black (5GY 2/1).

COMPONENTS: Hyaloclastite breccia consisting of altered angular vesicular basalt clasts that range in size from 10-50 mm. Other components include variably altered glass surrounding some of the clasts, fresh olivine in some of the clasts, occasional sulfides, and smectite found in the matrix.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

UNIT 8e: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 14-17

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli that is cemented by zeolite.

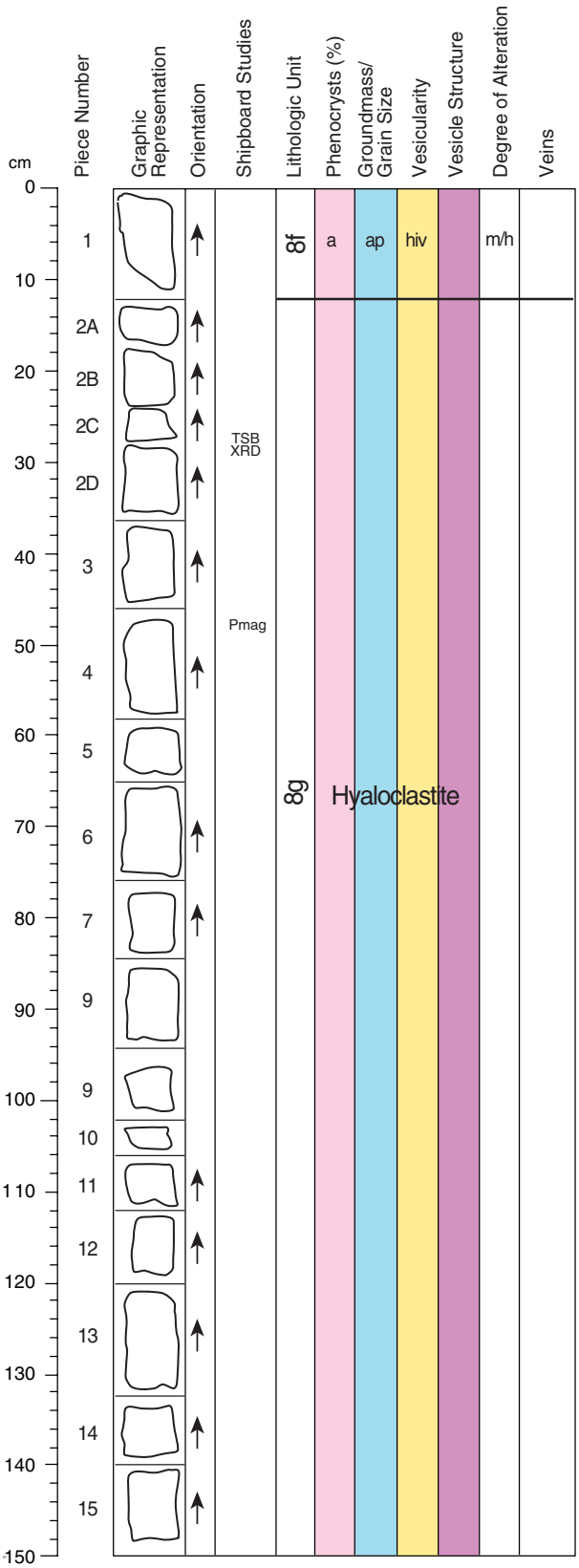
COLOR: Greenish gray (5GY 6/1) to greenish black (5GY 2/1).

COMPONENTS: Hyaloclastite breccia consisting of altered angular vesicular basalt clasts that range in size from 10 mm-50 mm, averaging approximately 15 mm. Other components include variably altered glass surrounding some of the clasts, fresh olivine in some of the clasts, occasional sulfides, and smectite found in the matrix.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-21R-3 (Section top: 174.73 mbsf)

UNIT 8f: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	2	0.5	0.5	Euhedral; equant
Plagioclase:	<<1	2	2	2	Subhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, olivine(?) and glass.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	50	1	Round

COLOR: Dark reddish brown (10R 3/4).

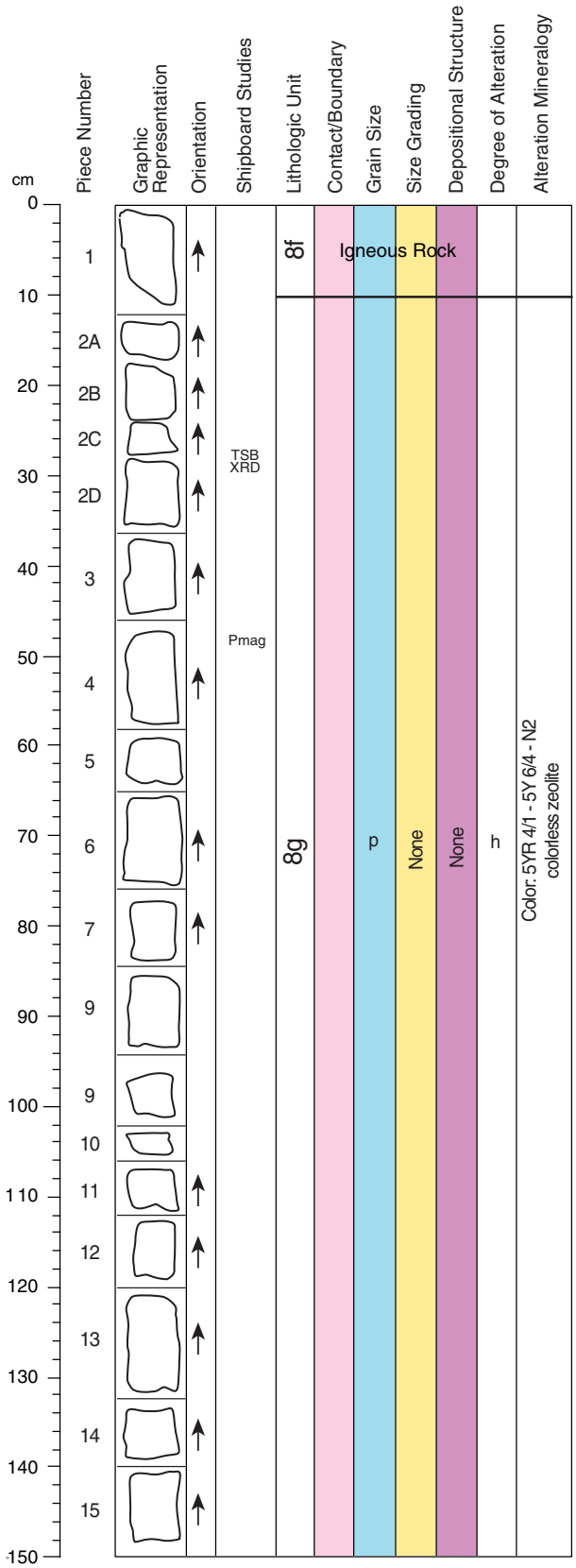
STRUCTURE: Vesicular and lobed. Lobe margin is inferred to be in Piece 1 at 10 cm, based on a change in crystallinity.

ALTERATION: Moderate to high. Olivine is partly replaced by Fe oxyhydroxide although occasionally remains unaltered. Groundmass olivine, if any, is unaltered. Vesicles are unfilled or are filled with carbonate, green clay and zeolite.

VEINS/FRACTURES: None.

COMMENTS: Olivine appears to be a microphenocryst phase.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-21R-3 (Section top: 174.73 mbsf)

UNIT 8g: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 2-15

CONTACTS: The contact between Subunit 8F (aphyric basalt) and 8G (hyaloclastite basaltic lapilli) is between Pieces 1 and 2.

GENERAL DESCRIPTION: Clast supported basaltic lapilli that is cemented by zeolite.

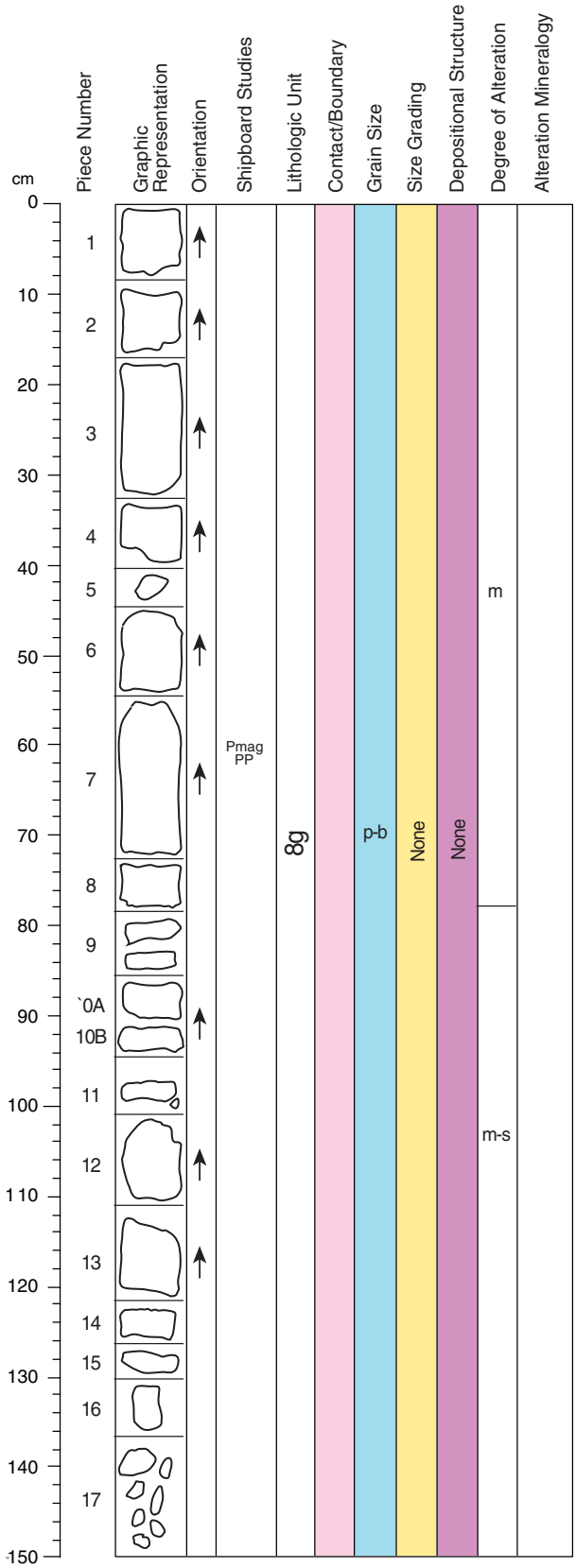
COLOR: Varied. Large clasts (>10 mm) are dusky yellow (5Y 6/4) or brownish gray (5 YR 4/1), and small clasts (<10 mm) are grayish black (N2).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 40 mm. Small clasts, with a size between 2 mm and 10 mm, are highly altered to grayish black (N2) clay. Some large clasts, with a size between 10 mm to 20 mm, are altered to dusky yellow (5Y 6/4). Three angular to subangular clasts are present in Pieces 6, 9 and 12, 30-50 mm in size, and are relatively less altered, with a color of brownish gray (5 YR 4/1). These three clasts are recognized as aphyric basalt. The cement and the filling of the vesicles in clasts are zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-50 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-21R-4 (Section top: 176.23 mbsf)

UNIT 8g: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-17

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Varied. Some clasts are light brownish gray (5YR 6/1). Most clasts are altered to grayish yellow (5Y 8/4) or moderate yellow (5Y 7/6), and the matrix is olive black (5Y 2/1).

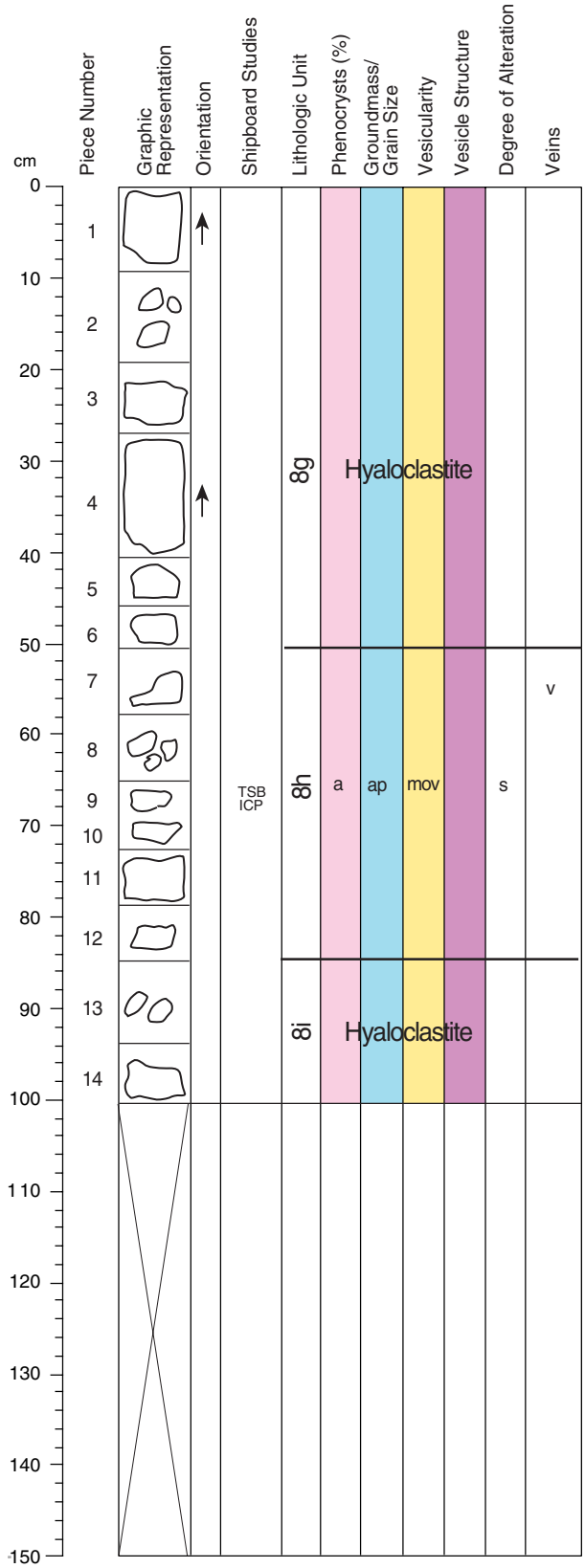
COMPONENTS: Angular clasts of vesicular to scoriaceous basalt, 1-20 mm wide.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Pieces 9, 10, and 12 consist of large (20-100 mm) basaltic clasts that are not interpreted as lobes due to the lack of evidence for lobe margins.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-21R-5 (Section top: 177.73 mbsf)

UNIT 8h: APHYRIC BASALT.

Pieces: 6-12

CONTACTS: None observed. Contact between Subunits 8H and 8I is between Pieces 5 and 6, based on the presence of a glassy lobe margin, and contact between Subunits 8I and 8J is inferred to be between Pieces 12 and 13.

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

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered glass.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
Moderately vesicular	10	1	Round

COLOR: Light brownish gray (5YR 6/1).

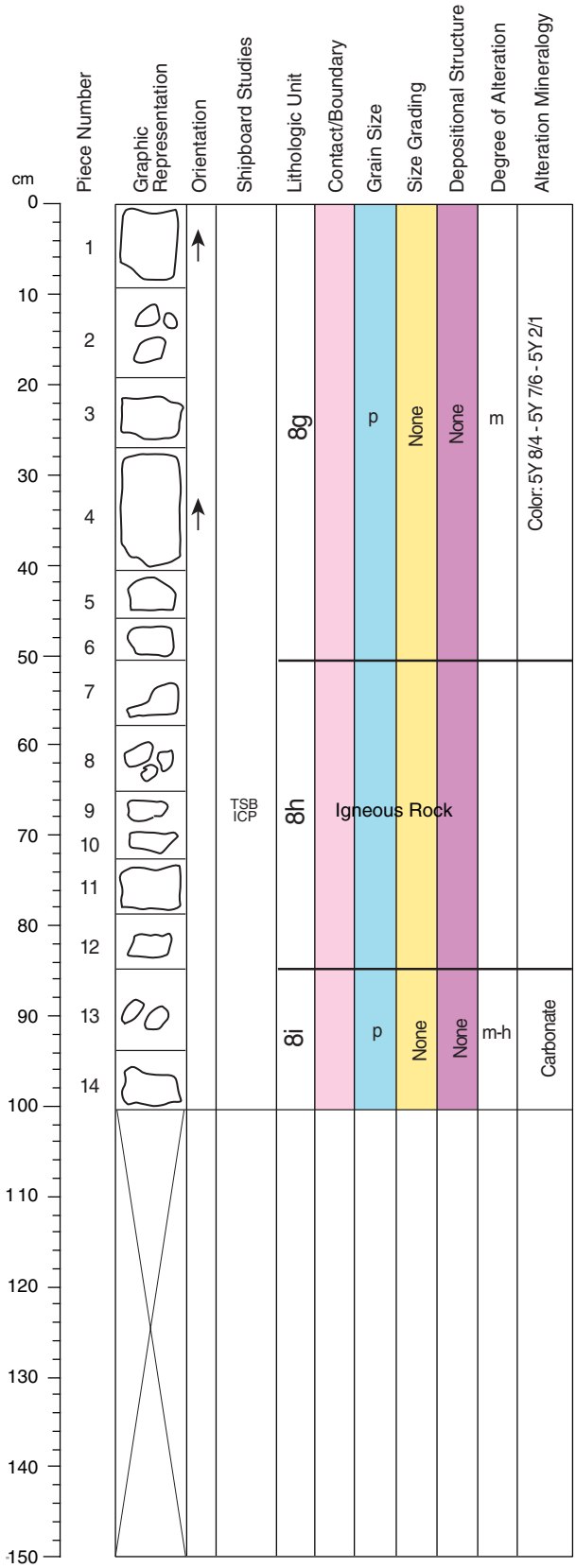
STRUCTURE: Vesicular and lobed. Lobe margins are inferred to be in Piece 6 at 46 cm, based on the change in crystallinity and presence of altered glass, and possibly in Piece 12.

ALTERATION: Slight. Olivine is partly replaced by Fe oxyhydroxide and green clays although occasionally remains unaltered (e.g., Piece 6). Vesicles are unfilled or are lined with green or yellow minerals with a botroidal habit, and dark gray clay. Occasional vesicles are filled with white carbonate.

VEINS/FRACTURES: Sparsely veined. A 5 mm wide vein is present in Piece 7 and is filled with white carbonate.

COMMENTS: Subunit represents one entire lobe.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-21R-5 (Section top: 177.73 mbsf)

UNIT 8g: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-5

CONTACTS: None observed. The contact between Subunit 8G and 8H is between Pieces 5 and 6.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Varied. Some clasts are light brownish gray (5YR 6/1). Most clasts are altered to grayish yellow (5Y 8/4) or moderate yellow (5Y 7/6), and the matrix is olive black (5Y 2/1).

COMPONENTS: Angular clasts of vesicular to scoriaceous basalt, 1-20 mm wide.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

UNIT 8i: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 13-14

CONTACTS: None observed. The contact between Subunit 8H and 8I is between Pieces 12 and 13.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Clasts are typically light brownish gray (5YR 6/1). The matrix is white (N9).

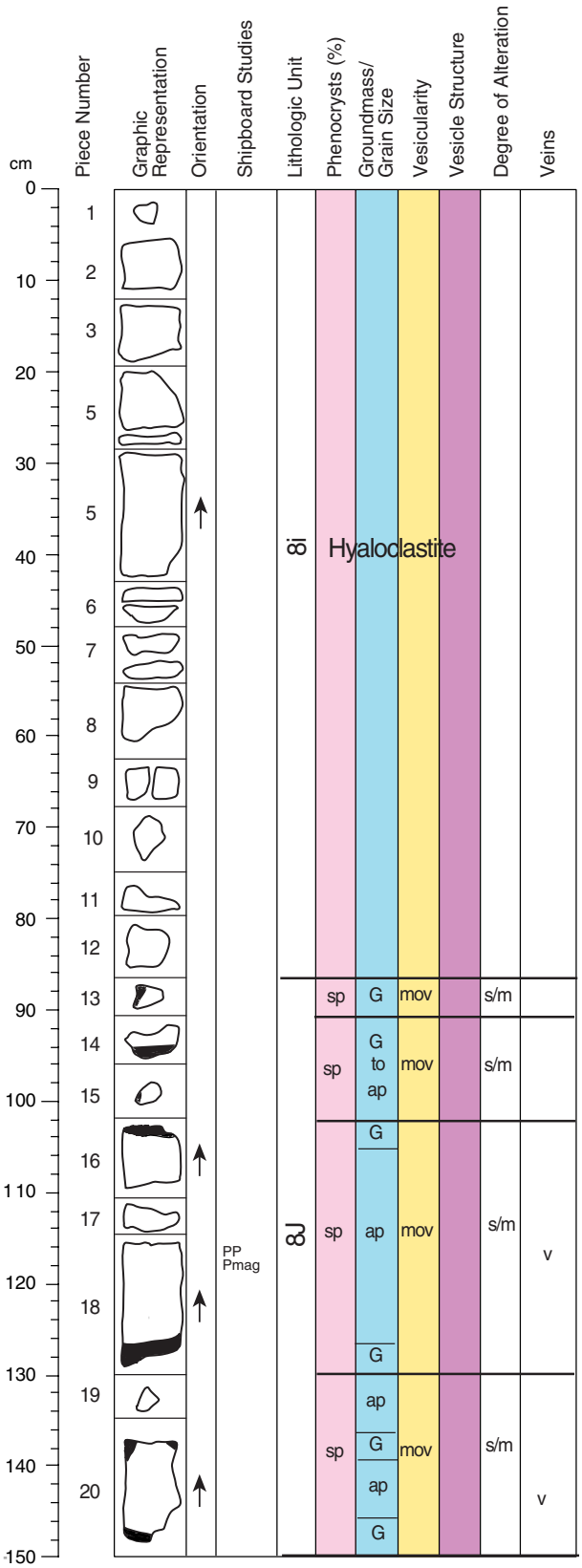
COMPONENTS: Angular clasts of vesicular basalt, 1-30 mm wide.

SEDIMENTARY TEXTURES: Unsorted and clast supported.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Piece 14 consists of two larger clasts (<30 mm) separated by white carbonate cement and angular smaller basaltic fragments.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-22R-1 (Section top: 181.4 mbsf)

UNIT 8j: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.
Pieces: 13-20

CONTACTS: The contact between Subunit 8J (sparsely olivine-phyric basalt) and Subunit 8I (hyaloclastite basalt lapilli breccia) is between Pieces 12 and 13.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1.5	2	0.5	1	Euhedral; equant
Plagioclase:	<<1	1	1	1	Subhedral
Clinopyroxene:	<<1	1	1	1	Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, olivine and glass.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	20	1	Round

COLOR: Dark gray (N3).

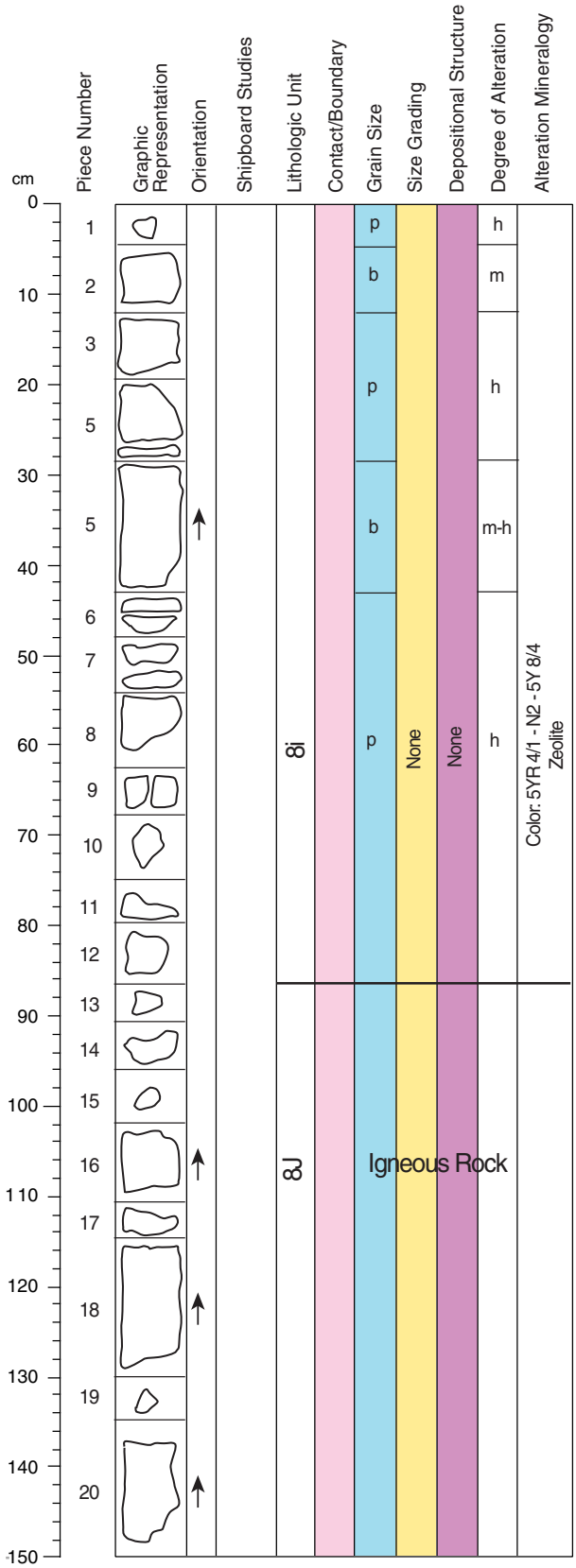
STRUCTURE: Vesicular and lobed. Lobe margins are inferred to be between Pieces 13 and 14 at 91 cm, Pieces 15 and 16 at 102 cm, Pieces 18 and 19 at 130 cm and the bottom of Piece 20 at 150 cm, based on the presence of glass and change in crystallinity.

ALTERATION: Slight to moderate. Olivine is partly replaced by Fe oxyhydroxide although occasionally remains unaltered. Groundmass olivine is unaltered. Vesicles are unfilled or are filled with white or green clay and zeolite.

VEINS/FRACTURES: Sparsely veined. 1-2 mm wide, randomly oriented veins are present in Pieces 18 and 20, and are filled with carbonate and Fe oxyhydroxide.

COMMENTS: Plagioclase and clinopyroxene phenocrysts are present in glomerocrysts intergrown with olivine.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-22R-1 (Section top: 181.4 mbsf)

UNIT 8i: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-12

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by zeolite.

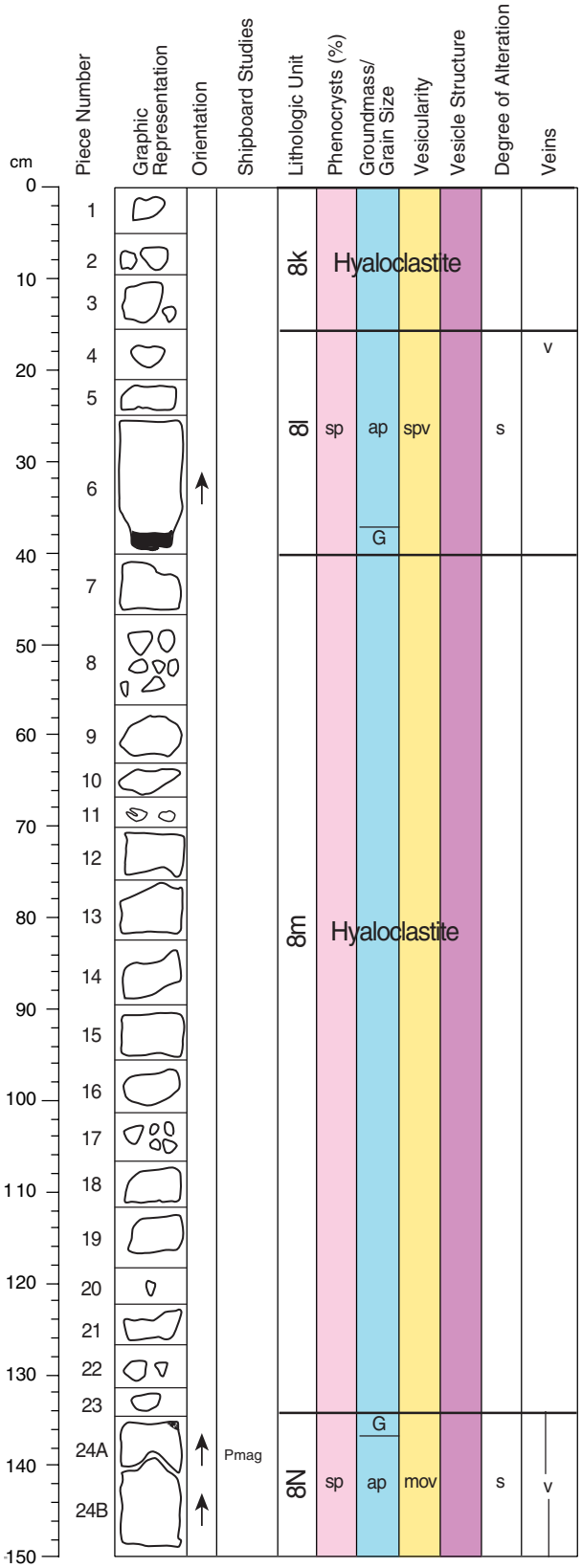
COLOR: Varied. Large clasts (>10 mm) are grayish yellow (5Y 8/4) or brownish gray (5 YR 4/1), and small clasts (<10 mm) are grayish black (N2), white (N9) and brownish gray (5 YR 4/1).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 70 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Rarely some of them are relatively less altered, and are brownish gray (5 YR 4/1) in color, and can be recognized as sparsely olivine-phyric to aphyric basalt. Some large clasts, with a size between 10 mm to 20 mm, are altered to grayish yellow (5Y 8/4) clay. Several angular to subangular clasts are present in Pieces 1, 2, 4, 5, 6 and 8, 20-50 mm in size, and are relatively less altered, with a color of brownish gray (5 YR 4/1). These clasts are recognized as sparsely olivine-phyric to aphyric basalt. The cement and the filling of the vesicles in clasts are zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-70 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-22R-2 (Section top: 182.89 mbsf)

UNIT 8l: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 4-6

CONTACTS: The contact between Subunit 8K (hyaloclastite basalt lapilli breccia) and Subunit 8L (sparsely olivine-phyric basalt) is between Pieces 3 and 4. The contact between Subunit 8L and 8M is between Piece 6 and Piece 7.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1.5	1.5	0.5	1	Euhedral; equant

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides and glass.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3-4	0.75	Round

COLOR: Dark gray (N3).

STRUCTURE: Vesicular and lobed. A glassy lobe margin is present in Piece 6.

ALTERATION: Slight. Olivine is partly to completely replaced by Fe oxyhydroxide, white carbonate and green clay although occasionally remains unaltered. Vesicles are unfilled or are filled with white or green clay and zeolite.

VEINS/FRACTURES: Sparsely veined. 0.5 mm wide, randomly oriented veins are present in Pieces 4, and are filled with white carbonate.

COMMENTS: The subunit represents an entire lobe.

UNIT 8n: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 24

CONTACTS: The contact between Subunit 8M (hyaloclastite basalt lapilli breccia) and Subunit 8N (sparsely olivine-phyric basalt) is between Pieces 23 and 24.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1.5	1.5	0.5	1	Euhedral; equant

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, dendritic black oxides and glass.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	5-6	0.75	Round

COLOR: Dark gray (N3).

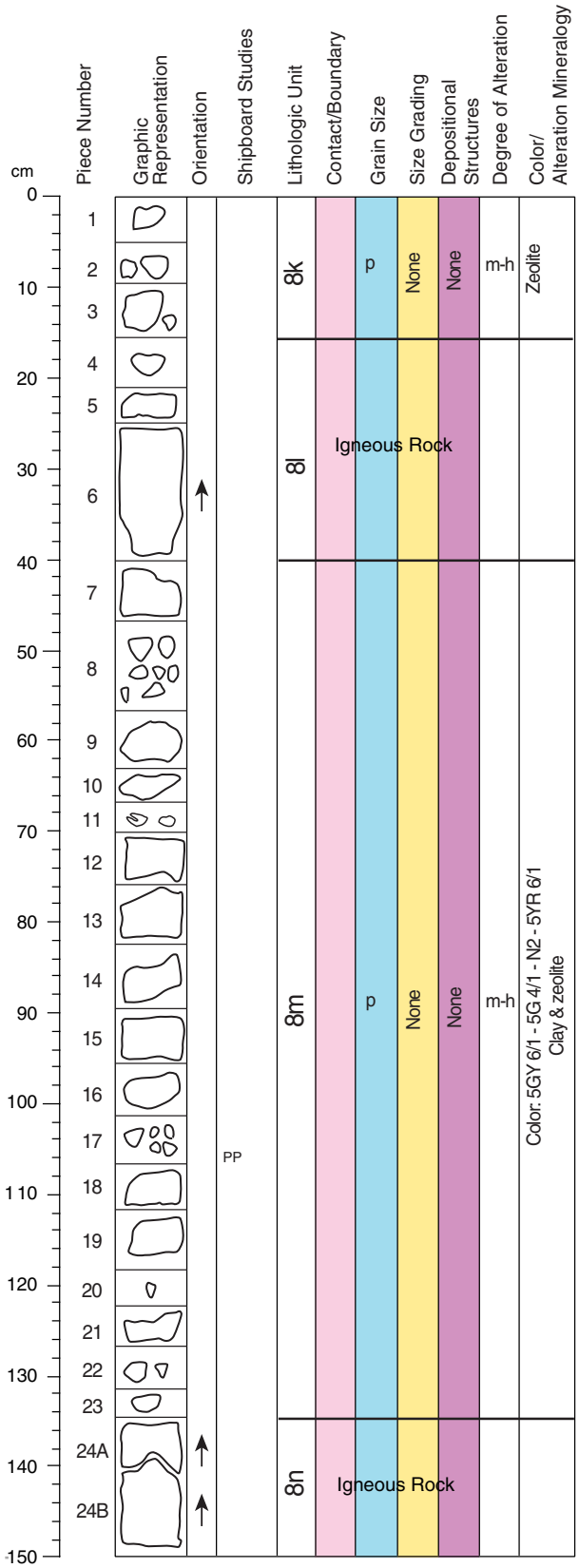
STRUCTURE: Vesicular and lobed. A glassy lobe margin is present in the top of Piece 24A.

ALTERATION: Slight. Olivine is partly to completely replaced by Fe oxyhydroxide, white carbonate and green clay although occasionally remains unaltered. Vesicles are unfilled or are filled with white or green clay and zeolite.

VEINS/FRACTURES: Sparsely veined. 0.5 mm wide, randomly oriented veins are present throughout, and are filled with white carbonate.

COMMENTS: The subunit represents an entire lobe.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-22R-2 (Section top: 182.89 mbsf)

UNIT 8K: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-3

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by zeolite.

COLOR: Varied. Large clasts (>10 mm) are brownish gray (5 YR 4/1), and small clasts (<10 mm) are grayish black (N2), white (N9).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 50 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Large clasts, with a size between 10 mm to 50 mm, are relatively less altered, with a color of brownish gray (5 YR 4/1). These clasts are recognized as aphyric basalt. The cement is zeolite. Vesicles in clasts are filled with zeolite or blue clay or are unfilled.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-50 mm.

SEDIMENTARY STRUCTURES: Massive.

UNIT 8M: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 7-23

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by zeolite.

COLOR: Varied. Large clasts (>10 mm) are brownish gray (5 YR 4/1) and light brownish gray (5 YR 6/1), and small clasts (<10 mm) are grayish black (N2), white (N9).

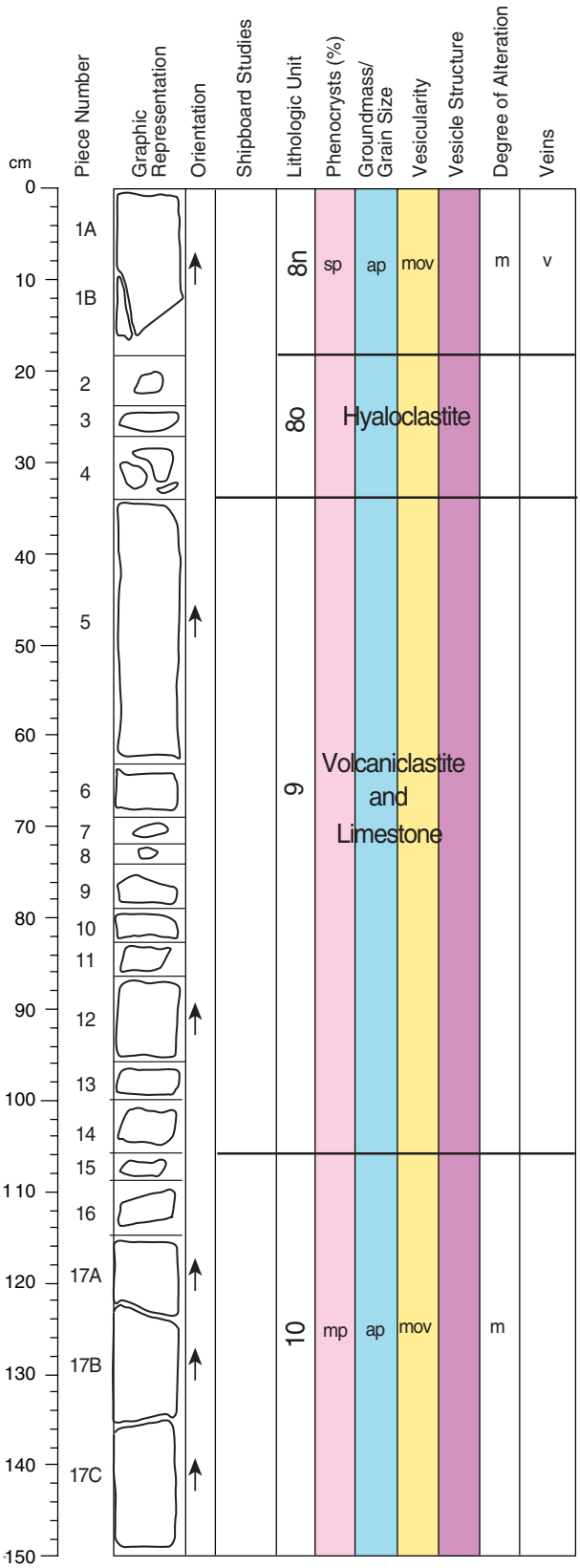
COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 50 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Large clasts, with a size between 10 mm to 50 mm, are relatively less altered, with a color of brownish gray (5 YR 4/1) or light brownish gray (5 YR 6/1) . These clasts are recognized as aphyric to sparsely olivine-phyric basalt. The cement is zeolite. Vesicles in clasts are filled with zeolite or blue clay or are unfilled.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-50 mm.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: Unaltered glass is present in the clasts in Piece 7.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-22R-3 (Section top: 184.39 mbsf)

UNIT 8n: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	2	1	0.6	0.75	Euhedral to anhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and olivine which ranges from groundmass size to microphenocrysts.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	14	1	Coalesced and irregular

COLOR: Medium gray (N5).

STRUCTURE: Lobed, with boundary to breccia inferred to be between Pieces 1B and 2.

ALTERATION: Moderate. Some olivine phenocrysts are replaced by yellow brown Fe oxyhydroxide. Vesicles are filled with gray clay. Vesicles contain white carbonates.

VEINS/FRACTURES: Sparsely veined. Randomly oriented veins (<1 mm) in Piece 1 contain green clay.

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 15-17

CONTACTS: The contact between Units 9 and 10 is in Piece 14, a limestone containing highly olivine-phyric lava fragments resting on the eroded surface of Unit 10.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	7	1	0.25	0.75	Euhedral to anhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and olivine which ranges from groundmass size to microphenocrysts.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	15	3	Coalesced and irregular

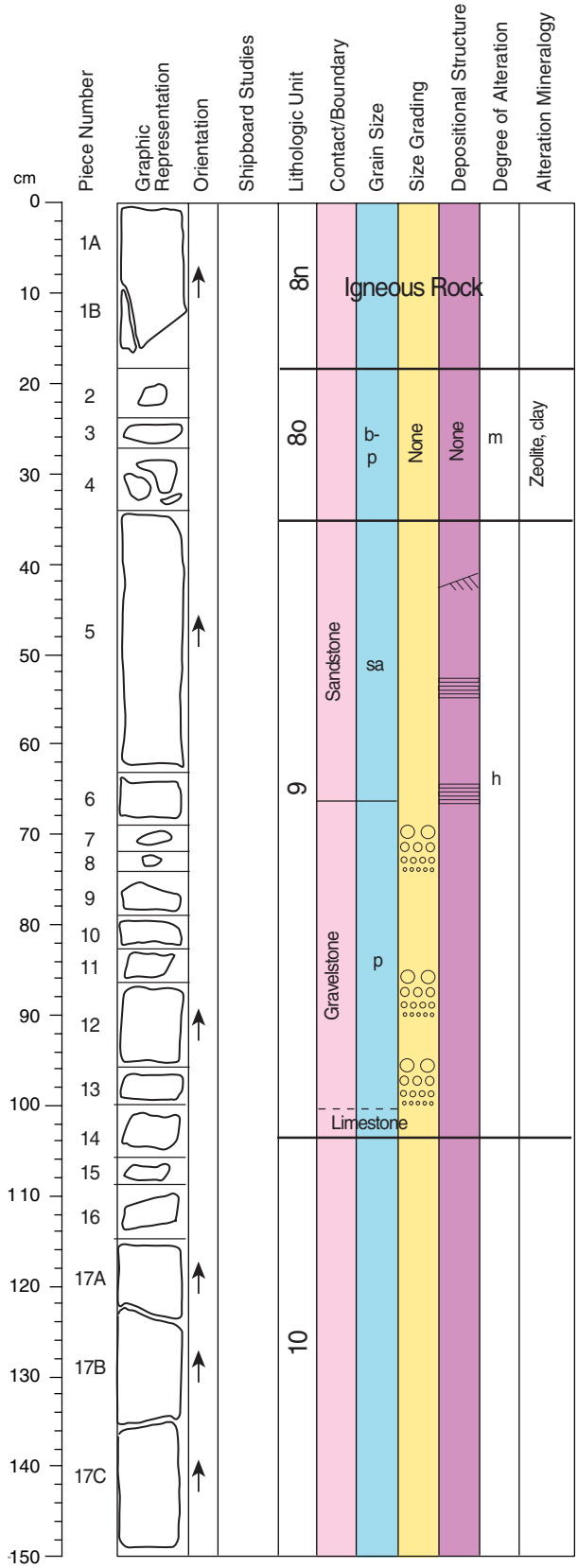
COLOR: Medium gray (N5).

STRUCTURE: This is the vesicular flow top of Unit 10.

ALTERATION: Moderate. Most olivine phenocrysts are replaced by yellow brown Fe oxyhydroxide. Most vesicles are unfilled, but 20% of the vesicles in Pieces 15 and 17C are filled with carbonate.

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-22R-3 (Section top: 184.39 mbsf)

UNIT 8o: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 2-4

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by zeolite.

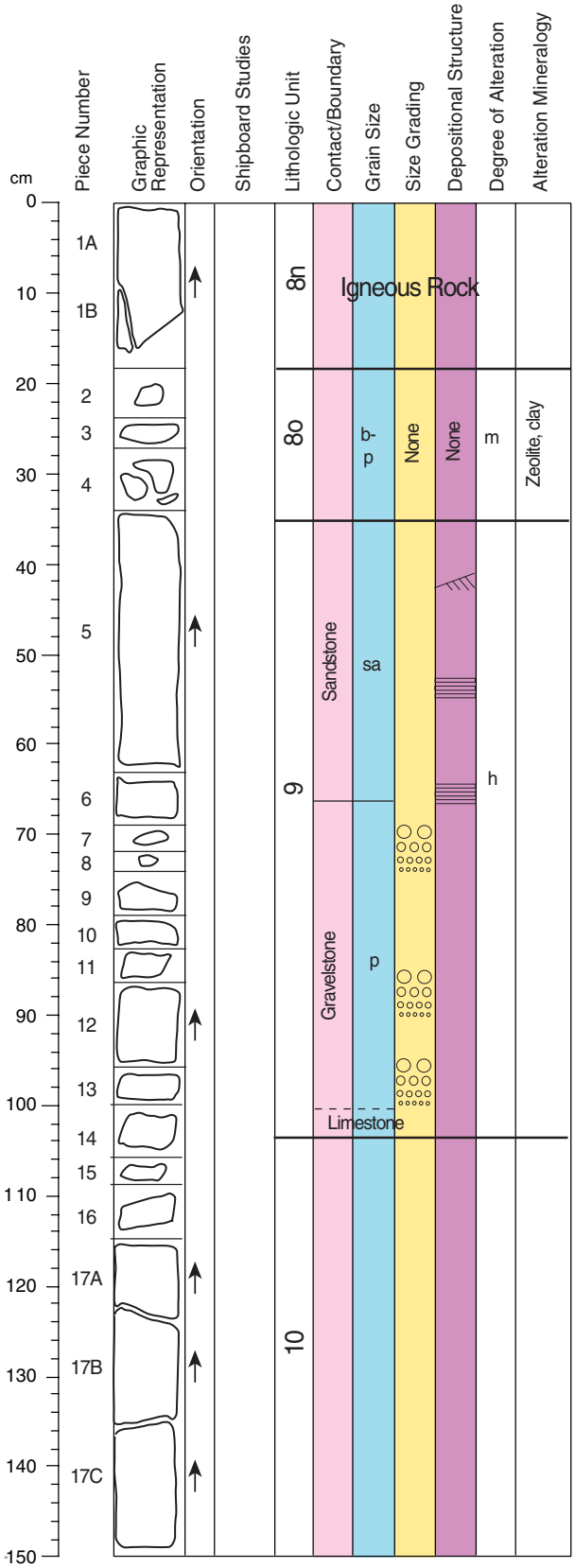
COLOR: Varied. Large clasts (>10 mm) are brownish gray (5 YR 4/1) and light brownish gray (5 YR 6/1), and small clasts (<10 mm) are grayish black (N2), white (N9).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 50 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Large clasts, with a size between 10 mm to 50 mm, are relatively less altered, with a color of brownish gray (5 YR 4/1) or light brownish gray (5 YR 6/1) . These clasts are recognized as aphyric to sparsely olivine-phyric basalt. The cement is zeolite. Vesicles in clasts are filled with zeolite or blue clay or are unfilled.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-50 mm.

SEDIMENTARY STRUCTURES: Massive, brecciated.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-22R-3 (Continued)

UNIT 9: VOLCANICLASTIC AND CALCARENITE INTERBED.

Pieces: 5-14

CONTACTS: The upper boundary between Units 8 and 9 is at the very top of Piece 5 and represents a conformable convoluted depositional contact. The lower boundary is at the bottom of Piece 14, where a thin bed of fossiliferous limestone rests on eroded flow surface of Unit 10.

GENERAL DESCRIPTION: This core interval consists of, from top to bottom: Cross-bedded to planar-bedded lithic-vitric sandstone (Pieces 5 and 6; 34-68 cm), thin bedded lithic-vitric gravelstone (Pieces 6-13; 68-100 cm), and fossiliferous limestone, containing highly olivine-phyric lava fragments.

COLOR: Varied. The sandstone and gravelstone (Pieces 5-13) are dark greenish gray (5 GY 4/1), whereas the limestone (Piece 14) is very light gray (N8).

COMPONENTS:
Interval 34-100 cm (Pieces 5-13):
50%, angular to subrounded crystalline lava fragments. Two lava types are identified within the population: aphyric basalt and moderately to highly olivine phyric basalt.*1.
43%, angular to subrounded and vesicular basalt glass fragments *2. The sideromelane glass has been replaced by green and yellowish white clay.
5%, subrounded carbonate and angular shell fragments along with rare specimens of fossilized benthic foraminifers.
2%, altered olivine phenocrysts, replaced by red and dark brown clay.

Interval 100-106 cm (Piece 14): Consists of subround carbonate and angular shell fragments, well-preserved benthic foraminifers shells, and dispersed 2-25 mm angular highly olivine phyric lava fragments.

SEDIMENTARY TEXTURES:
Interval 34-68 cm (Pieces 5-6): Fine to coarse sandstone with good to moderate sorting. Interval 68-100 cm (Pieces 6-13): Fine to medium gravelstone with inversely graded beds and very poor sorting.
Interval 100-106 cm (Piece 14): Medium sand with dispersed 2-25mm fragments.

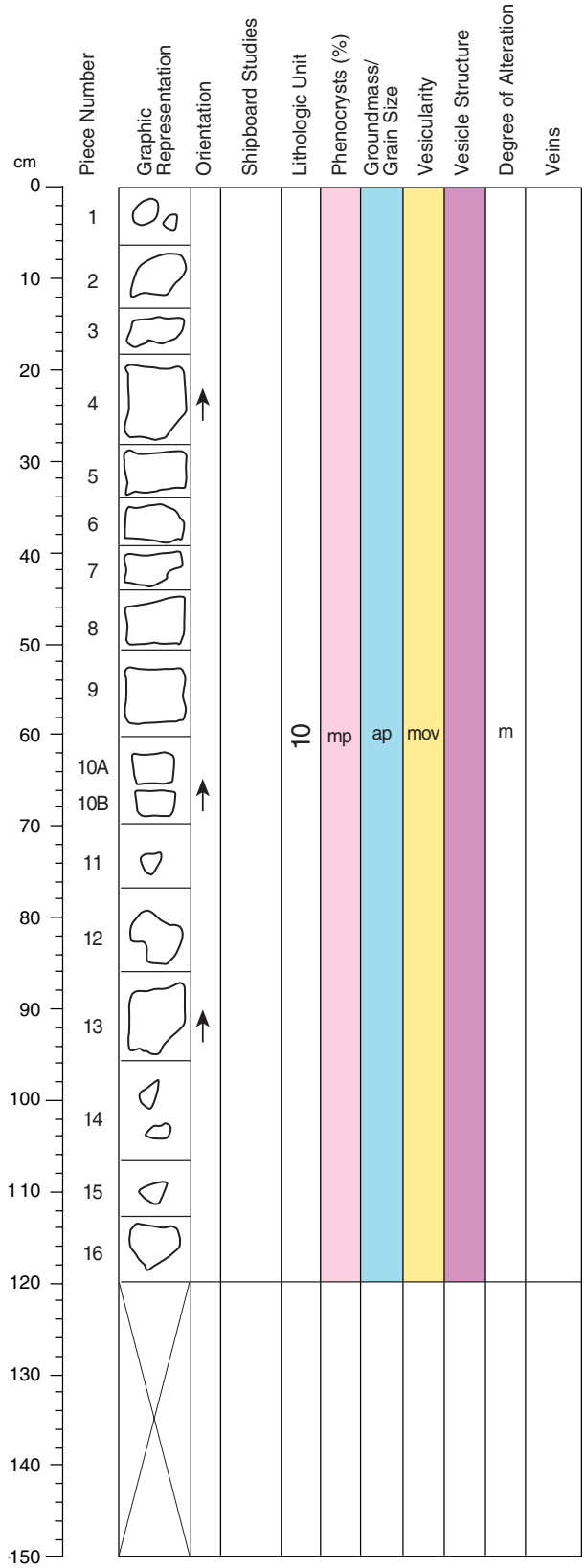
SEDIMENTARY STRUCTURES: Thinly bedded.
Interval 34-44 cm (Piece 5), cross-laminated sandstone.
Interval 44-68 cm (Piece 5), planar bedded sandstone alternating beds of medium and coarse sand *3.
Interval 68-100 cm (Pieces 6-13), thin bedded gravelstone with 3 inversely graded beds.
Interval 100-106 cm (Piece 14), massive limestone.

COMMENTS:
*1. The olivine-phyric lava clast must be derived from a lava formation that is not present at this level in the 1206 basalt lava succession, because both the underlying and overlying lava units do not have the corresponding modal abundance of olivine phenocrysts.

*2. The coarse sandstone laminae at 54 cm (Piece 5) and at 66 cm (Piece 6) contain significantly higher proportions (~60%) of basalt glass fragments.

*3. The bedding planes dip 16° to horizontal in the core.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-22R-4 (Section top: 185.89 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1–16

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	5	1	0.25	0.75	Euhedral to anhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and olivine which ranges from groundmass size to microphenocrysts.

VESICLES:

	% Mode	Size (mm): Average	Shape
Moderately vesicular	10	3	Coalesced and irregular

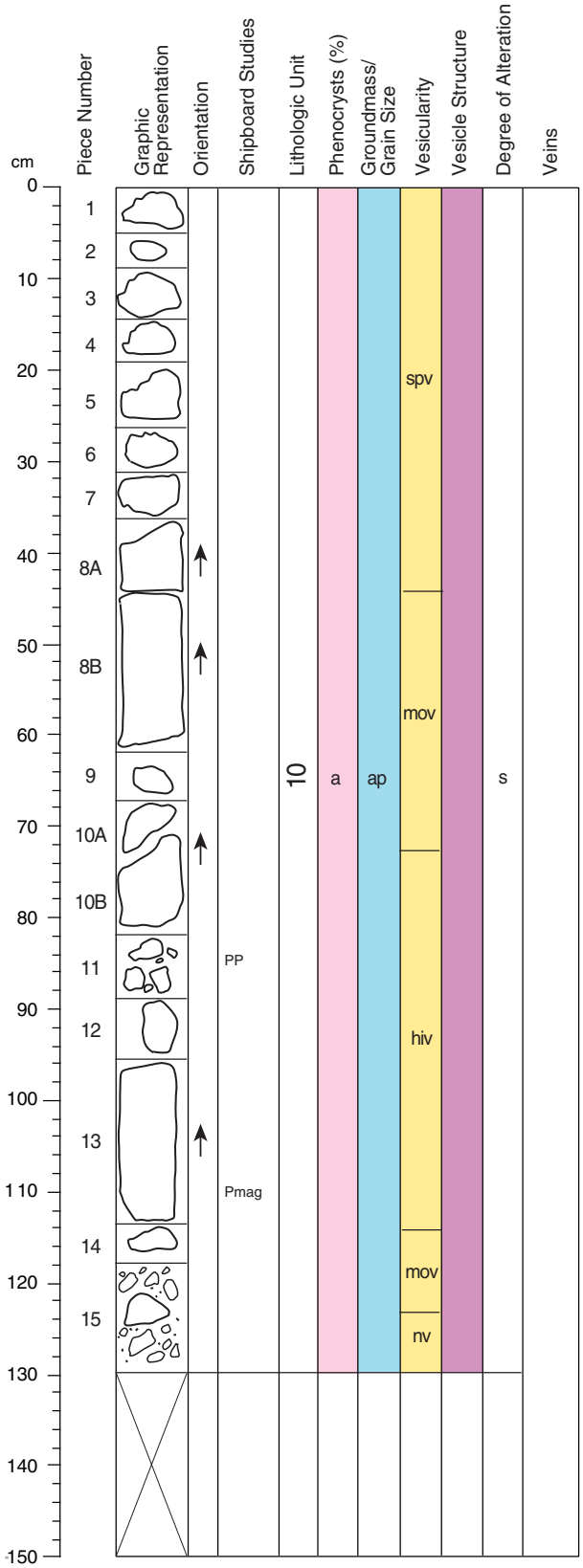
COLOR: Medium light gray (N6).

STRUCTURE: This is the vesicular flow top of Unit 10.

ALTERATION: Moderate. Most olivine phenocrysts are replaced by yellow brown Fe oxyhydroxide or dark greenish gray clay. Most vesicles are unfilled, but the largest vesicles (~10 mm) are filled with carbonate and a few smaller vesicles are filled with an expanding light brownish clay.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-23R-1 (Section top: 191.0 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

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

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis. A small amount of pyrite was found in the groundmass of some pieces.

VESICLES:	% Mode	Size (mm): Average	Shape
0-44 cm	2	8	Round to irregular
45-72 cm	10	5	Round to irregular
73-113 cm	22	1	Round
114-130 cm	<1		

COLOR: Medium light gray (N6).

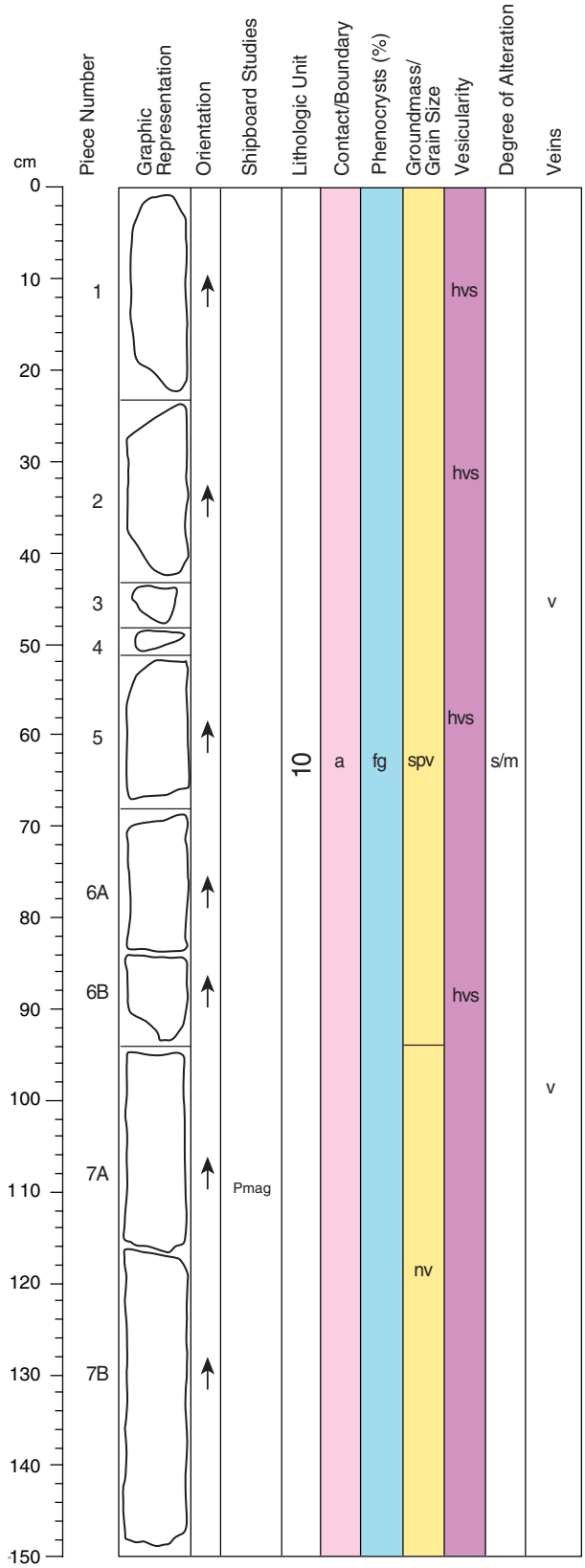
STRUCTURE: Massive flow top of Unit 10.

ALTERATION: Slight. Olivine microphenocrysts are frequently altered to orange iddingsite, but are also found nearly unaltered.

VEINS/FRACTURES: None.

COMMENTS: A highly vesicular zone is present from 44 cm to 118 cm. Piece 15 has experienced a high degree of drilling disturbance.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-24R-1 (Section top: 192.7 mbsf)

UNIT 10: APHYRIC TO MDERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-7B

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1.5	0.2	0.8	Subhedral; equant

GROUNDMASS: Fine grained. The groundmass contains plagioclase, clinopyroxene and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	0-3	1	Round

COLOR: Medium light gray (N6) to light gray (N7) and light bluish gray (5B 7/1).

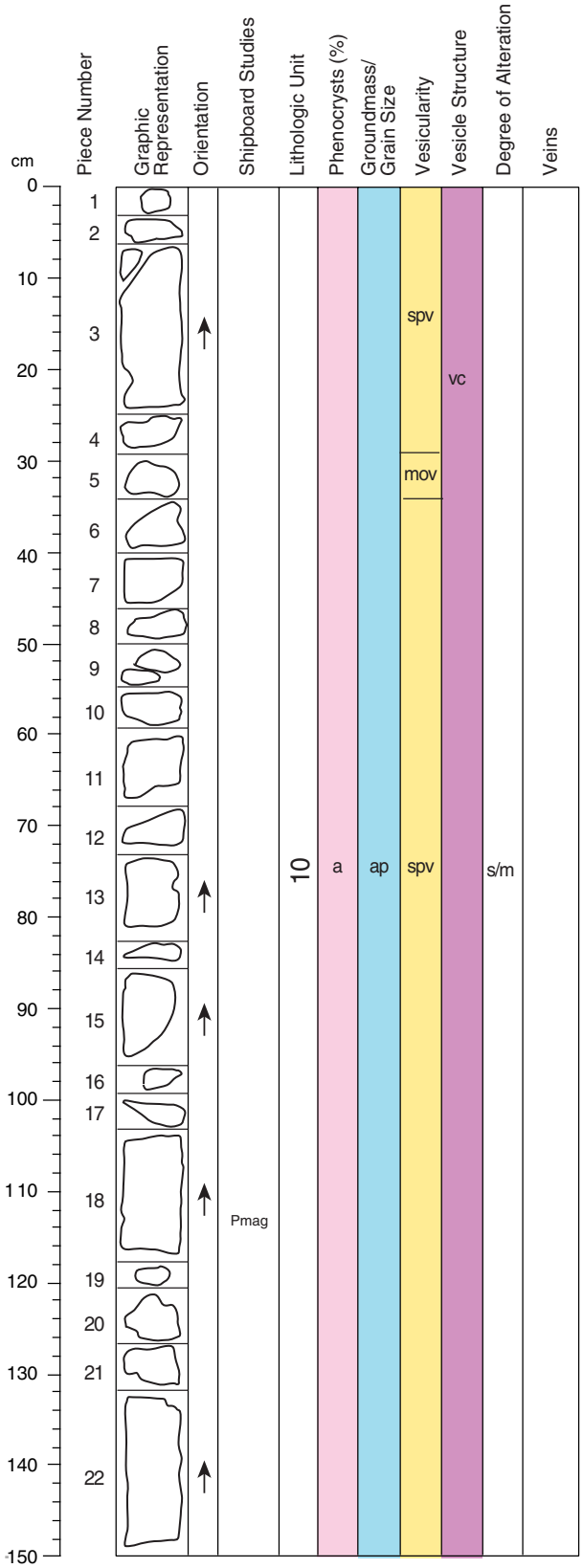
STRUCTURE: Massive.

ALTERATION: Slight to moderate. Olivine microphenocrysts are completely altered to Fe oxyhydroxide and green clay. Vesicles are partially filled with gray clay. A blue alteration halo is present in Pieces 7A and 7B.

VEINS/FRACTURES: Sparsely veined. Veins are <0.1-0.2 mm wide and filled with pale blue green clay.

COMMENTS: Coalescing vesicles in Pieces 1, 2, 5, and 6B form subhorizontal linear trails 0.1-3 mm. The thinner ones are filled with green clay and the larger ones with segregated material (i.e., segregation veins). Olivine may be present throughout as an unaltered microphenocryst phase. It is only readily identifiable where it has been altered.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-24R-2 (Section top: 194.2 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-22

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1.5	0.5	0.7	Subhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	1-10	2	Irregular

COLOR: Medium gray (N5).

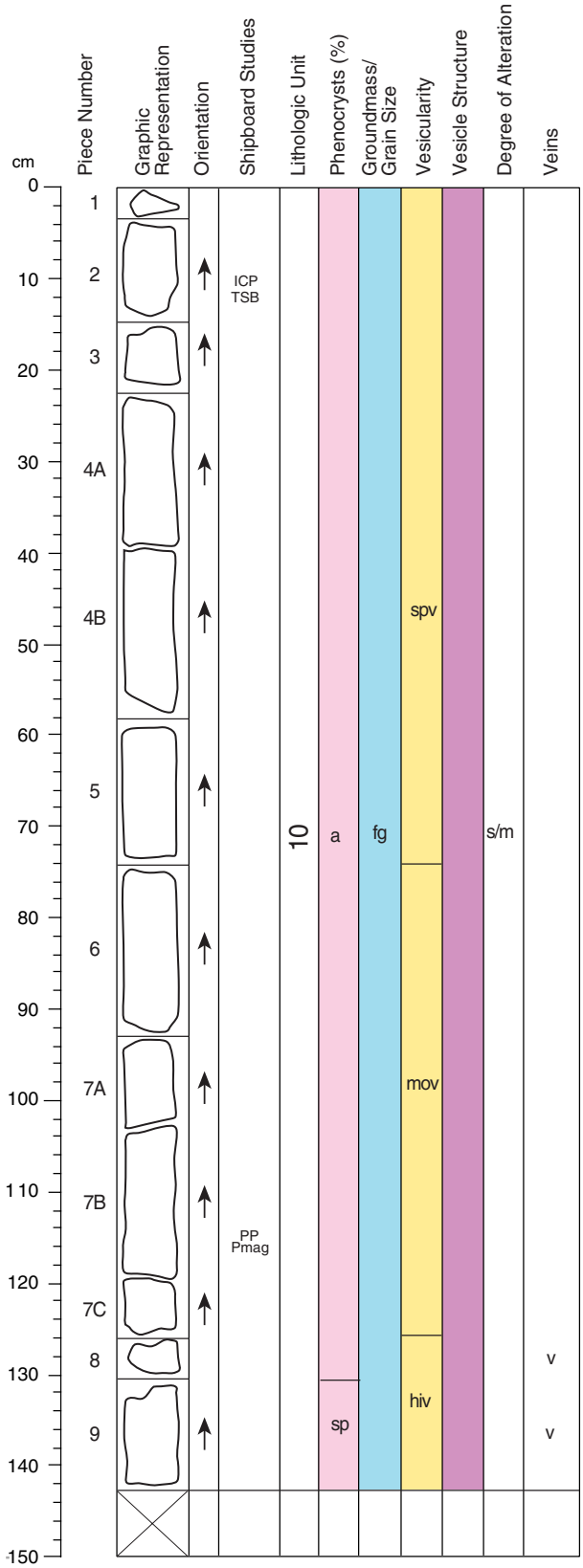
STRUCTURE: Massive.

ALTERATION: Moderate to slight. Olivine microphenocrysts are completely altered to Fe oxyhydroxide and greenish clay. Vesicles are partially filled with gray-green clay.

VEINS/FRACTURES: None.

COMMENTS: Piece 5 is moderately to highly vesicular, unlike all other pieces in this section, but there is no convincing evidence for the presence of a lobe boundary here. Vesicle cylinders are present in Pieces 3 and 4.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-24R-3 (Section top: 195.7 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1-2	1	0.2	0.3	Euhedral; equant

GROUNDMASS: Fine grained. The groundmass contains plagioclase, clinopyroxene and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
0-74 cm	1-2	4	Round
74-102 cm	5-10	3	Round
102-126 cm	10-20	2	Round
126-144 cm	25	1	Round

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

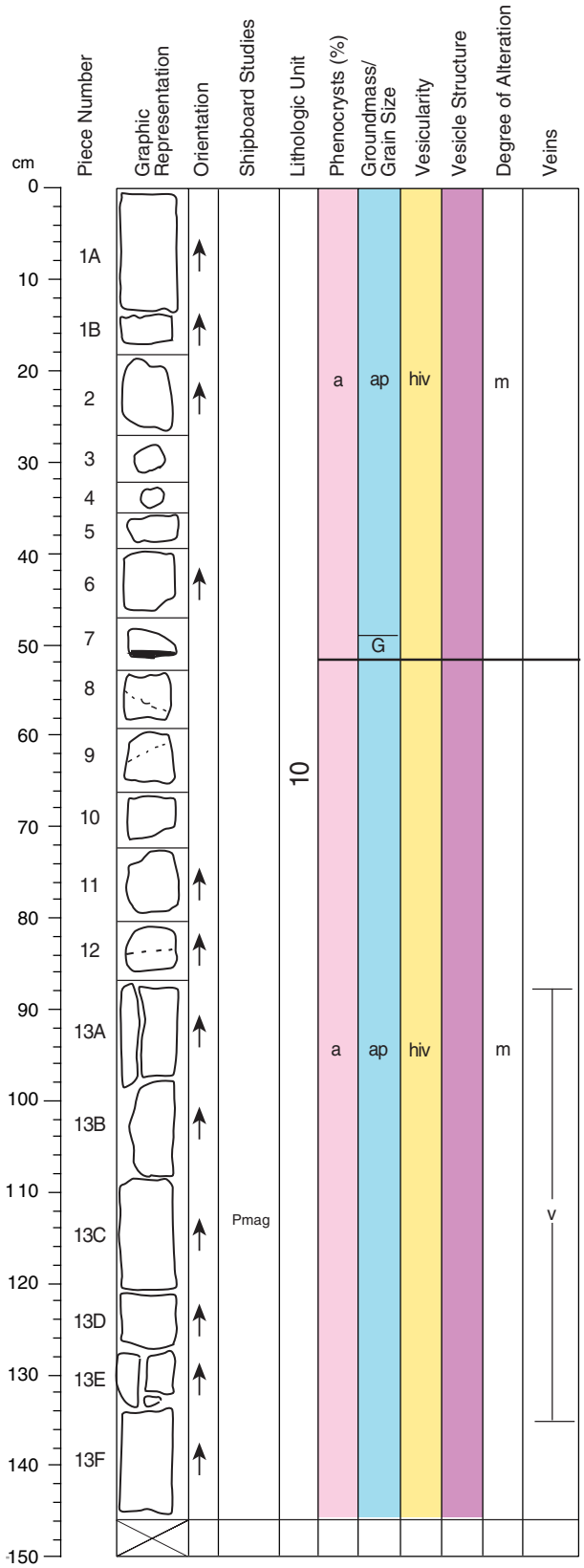
STRUCTURE: Massive. Indistinct horizontal flow foliation is present in Pieces 4 to 7C.

ALTERATION: Slight to moderate. Olivine microphenocrysts are completely replaced by green clay (Fe oxyhydroxide in Piece 9). Vesicles are partially filled with gray clay or pale blue clay.

VEINS/FRACTURES: One vein is present along the side of Pieces 8 and 9. It is filled with green clay.

COMMENTS: Olivine may be present throughout as an unaltered microphenocryst phase. It is only readily identifiable where it has been altered (e.g., Piece 9).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-24R-4 (Section top: 197.13 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-13

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1.5	0.2	0.5	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and completely altered olivine.

VESICLES:	% Mode	Size (mm): Average	Shape
0-35 cm	15-40	1	Round
35-45 cm	50-60	1	Round
45-85 cm	30-40	1	Round
85-145 cm	20-40	1-3	Irregular

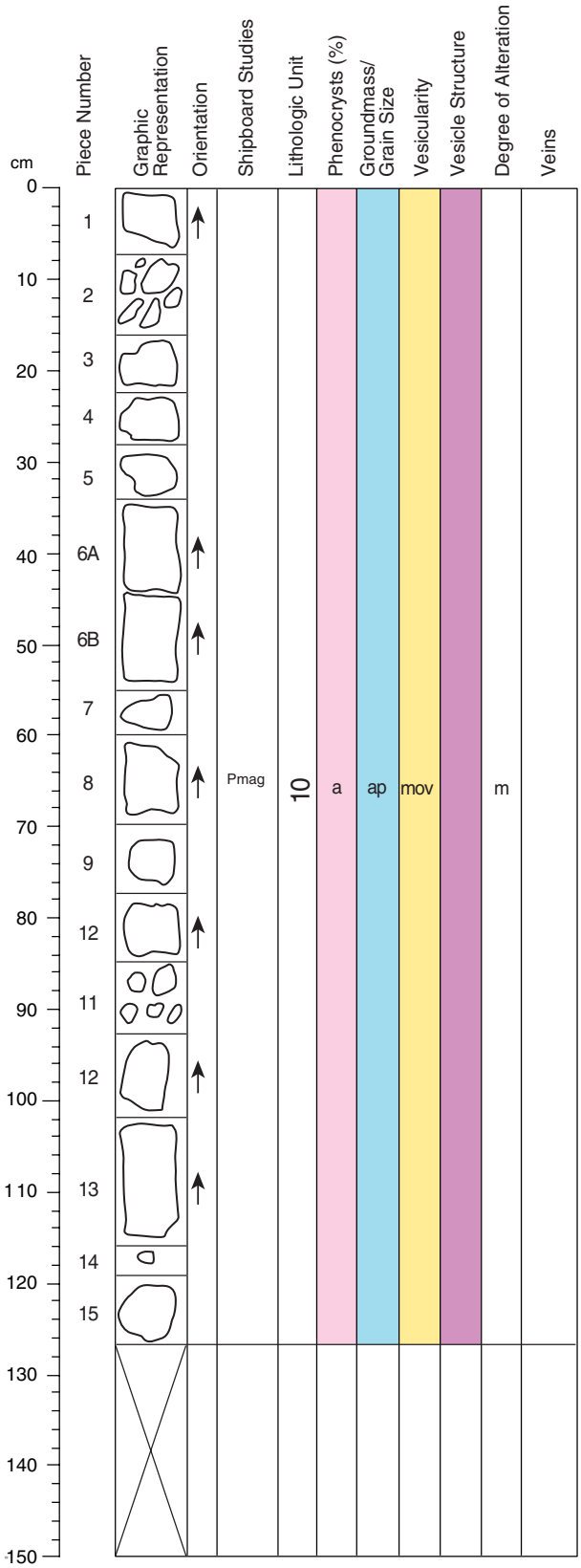
COLOR: Medium light gray (N5) from 0-30 cm and 130-145 cm, grading to pale reddish brown (10R 5/4) from 50-95 cm.

STRUCTURE: Vesicular and lobed. A lobe margin is suggested by a trace of completely altered glass on the back of Piece 7 at 50 cm.

ALTERATION: Moderate. Olivine is replaced by Fe oxyhydroxide and/or dark greenish gray and black clay. Groundmass mesostasis is altered to dark gray clay, except 50-110 cm it is highly altered to reddish brown clay. 0-30 cm, 62-83 cm, and 110-145 cm vesicles are lined with dark gray clay. Elsewhere almost all vesicles are lined or filled with carbonate. Vesicles within 20 mm of the subvertical vein from 88-135 cm are filled with carbonate.

VEINS/FRACTURES: Sparsely veined. At 88-135 cm a 1 mm wide subvertical vein is filled with carbonate. Sparsely fractured. At 50-65 cm and 85 cm carbonate filled fractures 10 mm to >20 mm wide are present.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-24R-5 (Section top: 198.6 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-15

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<<1	1.5	0.2	0.5	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and completely altered olivine.

VESICLES:

% Mode	Size (mm): Average	Shape
5-15	3	Subround to irregular

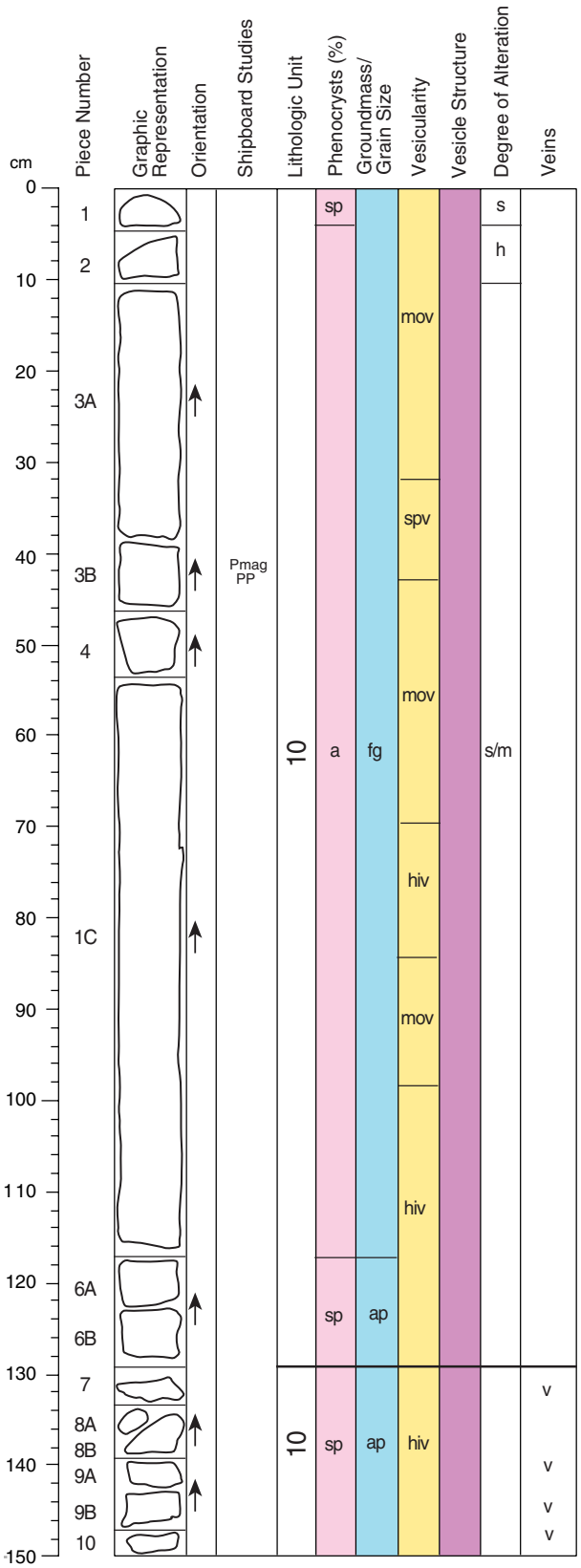
COLOR: Medium light gray (N6).

STRUCTURE: Vesicular.

ALTERATION: Moderate. Olivine is replaced by Fe oxyhydroxide and/or dark greenish gray and black clay. Groundmass mesostasis is altered to dark gray clay. Vesicles are lined with dark greenish gray clay, carbonate, and zeolite.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-25R-1 (Section top: 200.6 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1-2	1.5	0.5	0.8	Euhedral to subhedral; equant

GROUNDMASS: Fine grained to aphanitic. The groundmass contains plagioclase, clinopyroxene and black oxides in an intergranular texture.

VESICLES:	% Mode	Size (mm): Average	Shape
0-30 cm	10-20	2	Round
30-42 cm	1-3	3	Round
42-70 cm	10-15	2	Round
70-81 cm	25-30	1	Round
81-95 cm	10-15	5	Round to irregular
95-133 cm	25-35	1-2	Round to elongate
133-150 cm	25-30	2	Elongate to irregular

COLOR: Medium light gray (N6) to light gray (N7). Piece 2 is pale brown (5YR 5/2).

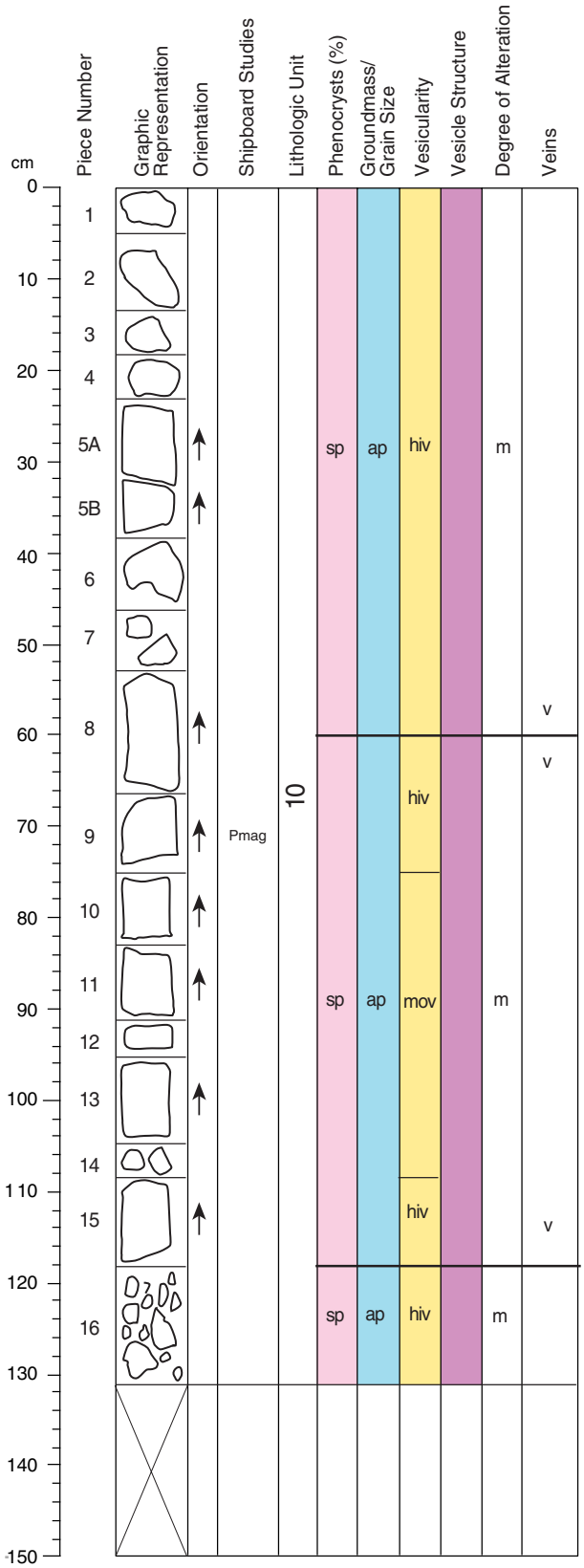
STRUCTURE: Lobed. Based on changes in vesicularity, a lobe boundary is present between Pieces 6B and 7 at 128 cm.

ALTERATION: Slight to moderate. Olivine microphenocrysts are completely replaced by green clay and Fe oxyhydroxide. Vesicles are partially filled with gray clay or completely filled with white carbonate in the interval 133-150 cm.

VEINS/FRACTURES: Sparsely veined. Veins are present in Pieces 7, 9A, 9B, and 10, usually along the side of the core. They are filled with white carbonate and green clay.

COMMENTS: Olivine may be present throughout as an unaltered microphenocryst phase. It is only readily identifiable where it has been altered (e.g., Piece 9).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-25R-2 (Section top: 202.1 mbsf)

UNIT 10: APHYRIC TO MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-16

CONTACTS: None.

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

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	10	4	Rounded

COLOR: Medium gray (N5).

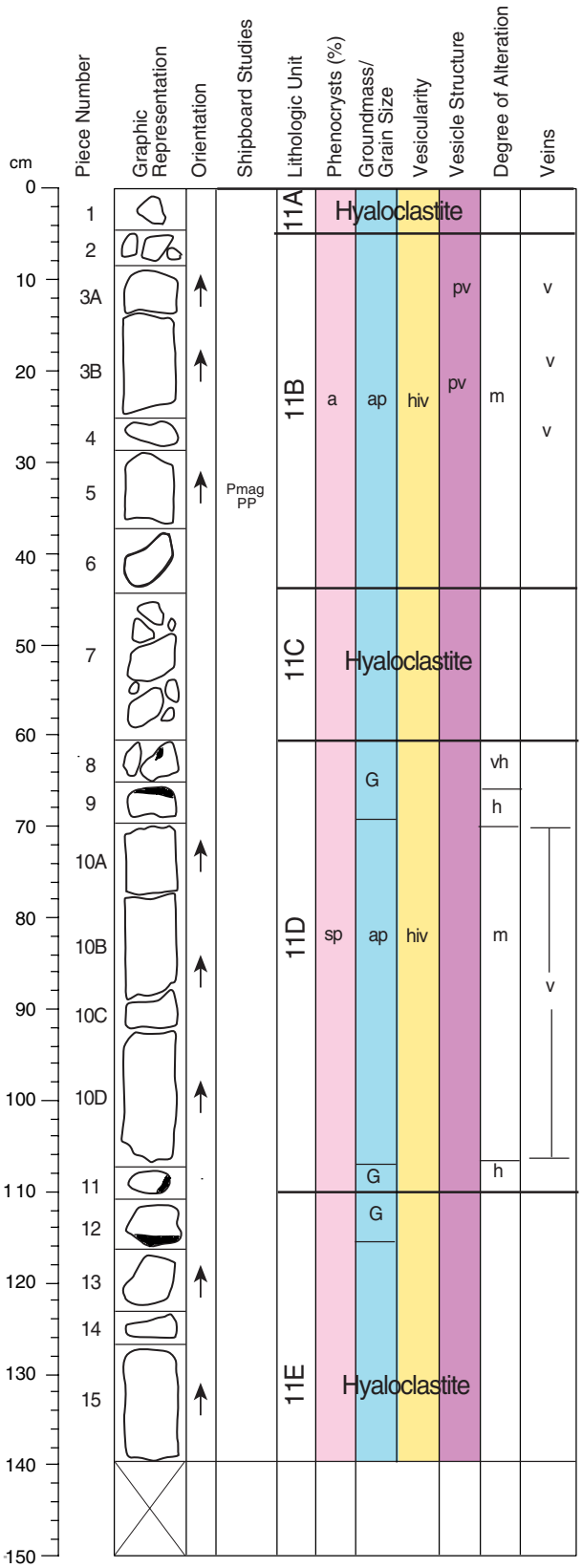
STRUCTURE: Vesicular, lobed. A lobe boundary is present in Piece 8. Another lobe boundary is probably present between Pieces 15 and 16.

ALTERATION: Moderate. Olivine phenocrysts are partially altered to Fe oxyhydroxide and carbonate. Vesicles are partially to completely filled with carbonate, or lined with gray clay. Colorless crystals of zeolite are present in Pieces 11 to 13.

VEINS/FRACTURES: Sparsely veined. Veins are 0.5-3 mm wide, randomly oriented and filled with carbonate.

COMMENTS: Occasional plagioclase microphenocrysts (<<1%) occur in this section. Pieces of massive limestone adhere to Pieces 15 and 16.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-26R-1 (Section top: 210.2 mbsf)

UNIT 11A: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1

CONTACTS: None observed. The top of Unit 11A is inferred to be at the top of Section 26R-1 because of a change in lithology from basalt to breccia. The boundary between Subunits 11A and 11B (basalt) is inferred to be at 4 cm, between Pieces 1 and 2.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia consisting of one large (~3 cm) basalt clast with adhering altered, brecciated glass fragments.

COLOR: Brownish gray (5YR 4/1) to pale green (10G 6/2).

COMPONENTS: Angular clasts of highly vesicular basalt, and basaltic glass. The size of clasts varies from 3 mm to >30 mm. The basalt is sparsely plagioclase-olivine-phyric and moderately vesicular. Olivine is replaced by dark green clay (which also fills the vesicles) and Fe oxyhydroxide. Plagioclase fragments, completely altered glass, and basalt clasts are cemented by zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, clast supported. Fine to medium gravel-size fragments (3–30 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.UNIT 11B: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

UNIT 11B: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 2-6B

CONTACTS: None observed. The boundary between Subunits 11A (hyaloclastite lapilli breccia) and 11B is inferred to be between Pieces 1 and 2 at 4 cm. The boundary between Subunits 11B and 11C (hyaloclastite basalt lapilli breccia) is inferred to be at 44 cm between Pieces 6B and 7.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3.5	0.5	1	Subhedral laths
Olivine:	<1	1.5	0.2	0.5	Subhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	30-35	0.5	Round

COLOR: Medium gray (N5).

STRUCTURE: Vesicular.

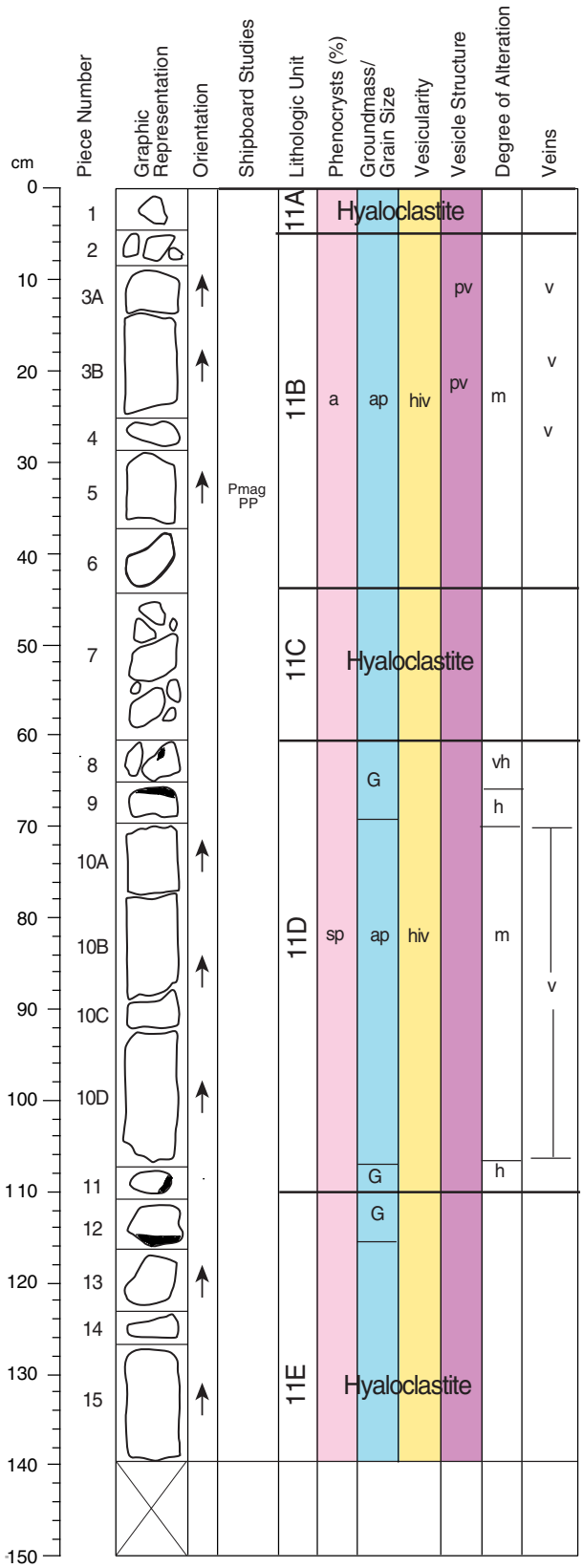
ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, <0.1-2 mm wide and filled with white carbonate and dark green clay.

COMMENTS: Pipe vesicles (1-2 cm long) are present in Pieces 3A and 3B. They are either unfilled or filled with white carbonate and dark green clay.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-26R-1 (Continued)

UNIT 11C: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 7

CONTACTS: None observed. The boundary between Subunits 11B (basalt) and 11C is inferred to be at 44 cm, between Pieces 6B and 7. The boundary between Subunits 11C and 11D (basalt) is inferred to be at 60 cm, between Pieces 7 and 8.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Grayish yellow green (5GY 7/2), pale green (10G 6/2), brownish gray (5YR 4/1).

COMPONENTS: Angular to subround clasts of moderately to highly vesicular basalt and basaltic glass. The size of clasts varies from 4 mm to 25 mm. The basalt is highly to completely altered and clasts have glassy rims. Most clasts are completely altered, highly vesicular glass. No phenocrysts are apparent, but this may be a function of alteration.

SEDIMENTARY TEXTURES: Unsorted, clast supported. Fine to medium gravel-size fragments (4–25 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

COMMENTS: Piece 7 contains many fragments of hyaloclastite basalt lapilli breccia.

UNIT 11D: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 8-11

CONTACTS: None observed. The boundary between Subunits 11C (hyaloclastite basalt lapilli breccia) and 11D is inferred to be between Pieces 7 and 8 at 60 cm. The boundary between Subunits 11D and 11E (hyaloclastite basalt lapilli breccia) is inferred to be at 110 cm between Pieces 11 and 12.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	3.5	0.5	0.8	Subhedral; blocky
Olivine:	<1-2	1.5	0.2	0.5	Euhedral; equant

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	20-30	0.5	Round

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

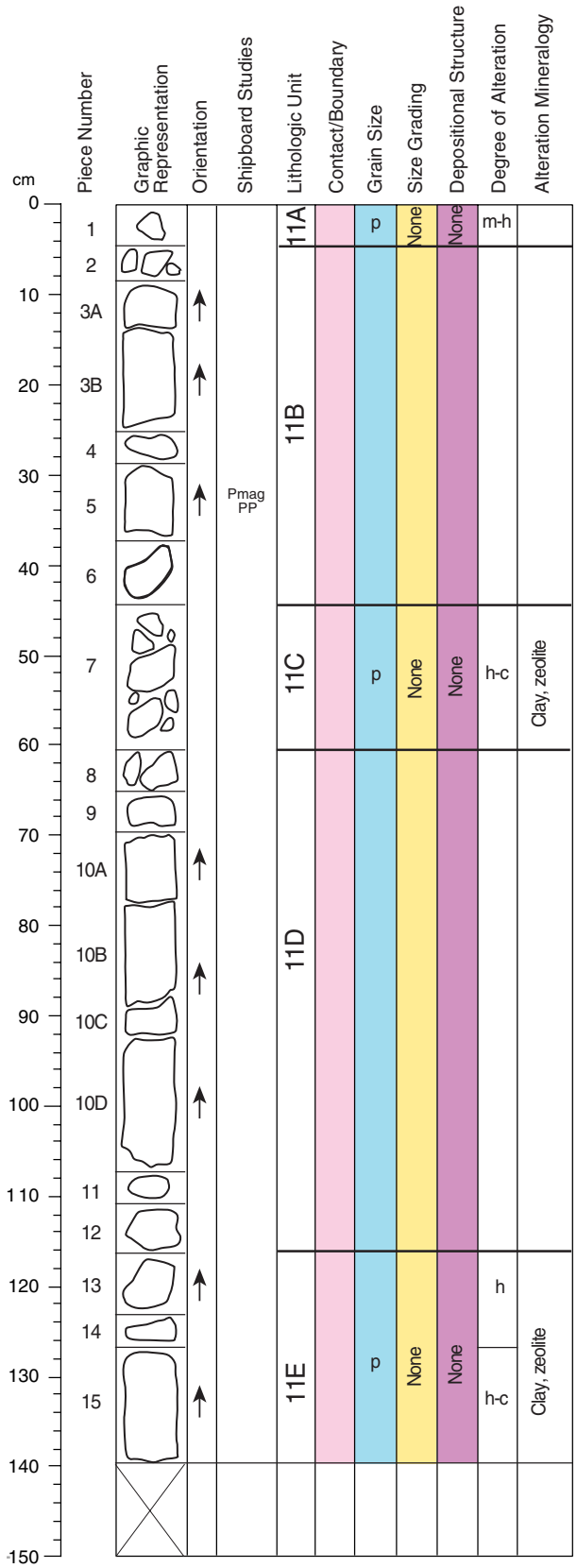
STRUCTURE: Lobed. Completely altered glassy lobe margins are present in Pieces 8, 9, 11, and 12.

ALTERATION: Moderate to complete. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with white carbonate and dark green clay.

VEINS/FRACTURES: Moderately veined. Veins are vertical to subvertical, <0.1-1 mm wide and filled with white carbonate, dark green clay, and Fe oxyhydroxide.

COMMENTS: Olivine may be present as a microphenocryst phase.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-26R-1 (Section top: 210.2 mbsf)

UNIT 11A: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1

CONTACTS: None observed. The top of Unit 11A is inferred to be at the top of Section 26R-1 because of a change in lithology from basalt to breccia. The boundary between Subunits 11A and 11B (basalt) is inferred to be at 4 cm, between Pieces 1 and 2.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia consisting of one large (~3 cm) basalt clast with adhering altered, brecciated glass fragments.

COLOR: Brownish gray (5YR 4/1) to pale green (10G 6/2).

COMPONENTS: Angular clasts of highly vesicular basalt, and basaltic glass. The size of clasts varies from 3 mm to >30 mm. The basalt is sparsely plagioclase-olivine-phyric and moderately vesicular. Olivine is replaced by dark green clay (which also fills the vesicles) and Fe oxyhydroxide. Plagioclase fragments, completely altered glass, and basalt clasts are cemented by zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, clast supported. Fine to medium gravel-size fragments (3-30 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

UNIT 11C: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 7

CONTACTS: None observed. The boundary between Subunits 11B (basalt) and 11C is inferred to be at 44 cm, between Pieces 6B and 7. The boundary between Subunits 11C and 11D (basalt) is inferred to be at 60 cm, between Pieces 7 and 8.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

COLOR: Grayish yellow green (5GY 7/2), pale green (10G 6/2), brownish gray (5YR 4/1).

COMPONENTS: Angular to subround clasts of moderately to highly vesicular basalt and basaltic glass. The size of clasts varies from 4 mm to 25 mm. The basalt is highly to completely altered and clasts have glassy rims. Most clasts are completely altered, highly vesicular glass. No phenocrysts are apparent, but this may be a function of alteration.

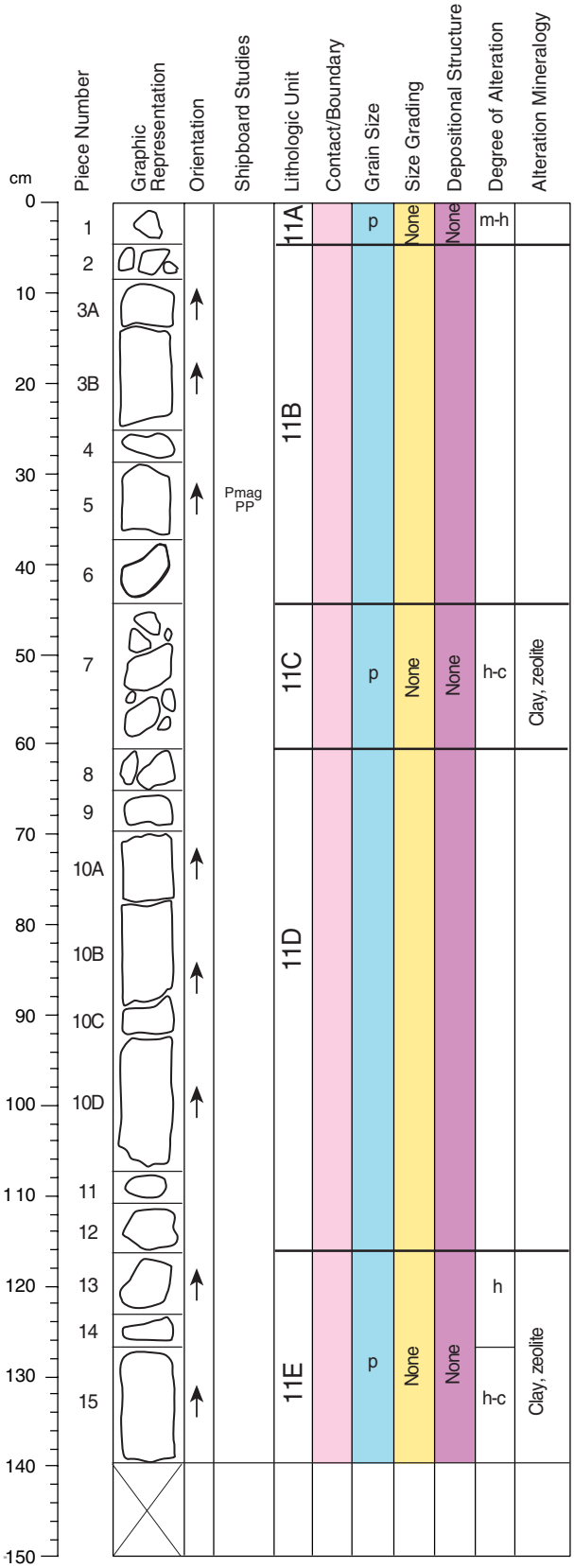
SEDIMENTARY TEXTURES: Unsorted, clast supported. Fine to medium gravel-size fragments (4-25 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

COMMENTS: Piece 7 contains many fragments of hyaloclastite basalt lapilli breccia.

(Continued on next page.)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-26R-1 (Continued)

UNIT 11E: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 12-15

CONTACTS: None observed. The boundary between Subunits 11D (basalt) and 11E is inferred to be at 110 cm, between Pieces 11 and 12.

GENERAL DESCRIPTION: Clast to matrix supported basaltic lapilli breccia.

COLOR: Grayish yellow green (5GY 7/2), dusky yellowish green (10GY 3/2), brownish gray (5YR 4/1), light brownish gray (5YR 6/1).

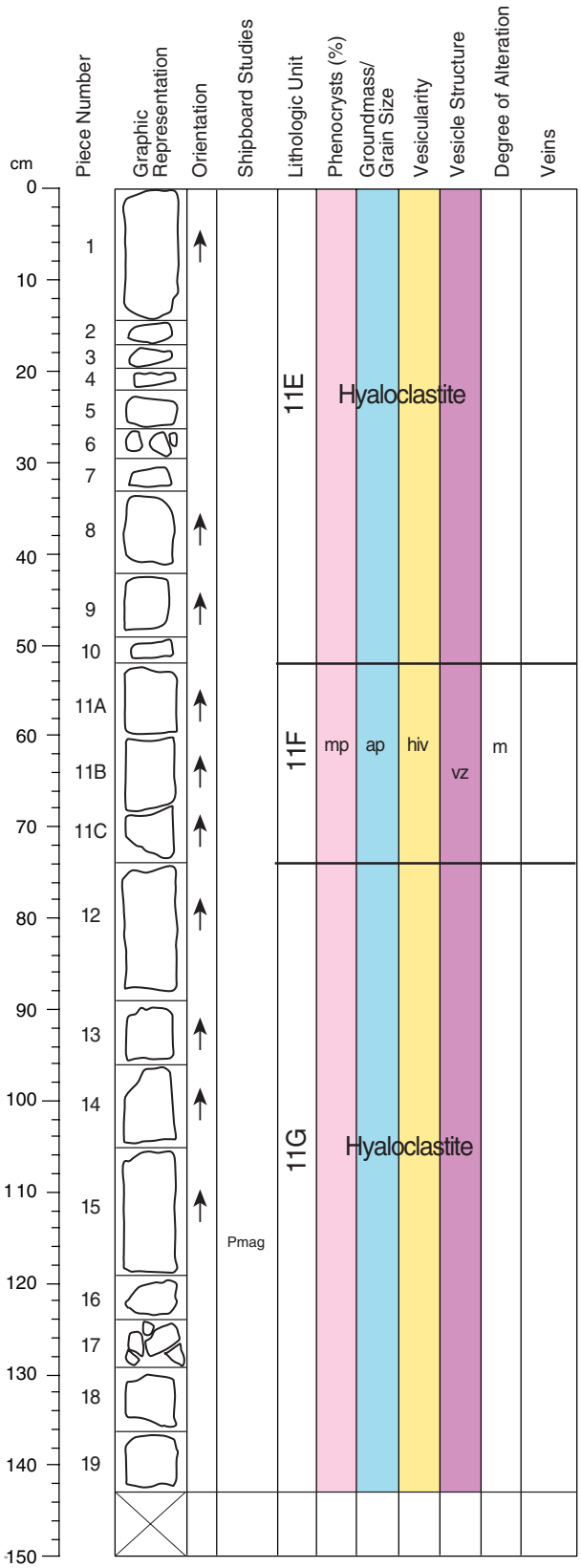
COMPONENTS: Angular to subround clasts of moderately to highly vesicular basalt and basaltic glass. The size of clasts varies from 2 mm to >60 mm. The basalt is highly altered and contains plagioclase and olivine phenocrysts, that comprise ~1%, set in an aphanitic groundmass. Olivine is altered to dark green clay, but plagioclase appears unaltered. Glass clasts are moderately to highly vesicular and partially altered to dark green clay. The clasts are cemented by zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, clast to matrix supported. Gravel-size fragments (2->60 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

COMMENTS: Unaltered glass is present in Piece 15.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-26R-2 (Section top: 211.6 mbsf)

UNIT 11F: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 11A-11C

CONTACTS: The contact between Subunits 11E and 11F is inferred to be between Pieces 10 and 11A at 52 cm. The contact between Subunits 11F and 11G is inferred to be between Pieces 11C and 12 at 74 cm.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	1	1	0.5	0.5	Equant
Plagioclase	2	1.5	0.5	0.8	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
Highly vesicular	30	0.5	Round

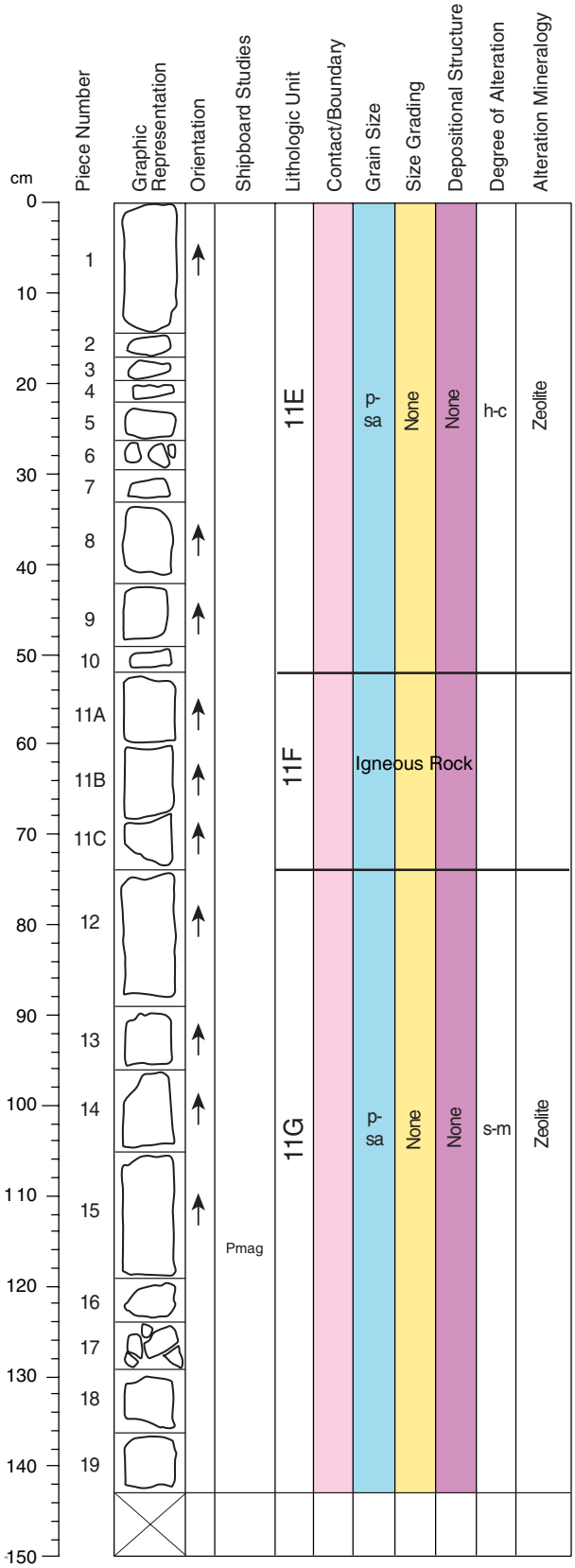
COLOR: Medium gray (N5). Greenish gray next to the contacts (5GY 6/1).

STRUCTURE: Vesicular, lobed.

ALTERATION: Moderate. Olivine phenocrysts are partially to completely altered to Fe oxyhydroxide and green clay. Vesicles are filled with zeolite, or green clay (saponite nontronite).

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-26R-2 (Section top: 211.6 mbsf)

UNIT 11E: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-10

CONTACTS: None observed. The boundary between Subunits 11E and 11F (basalt) is inferred to be at 52 cm, between Pieces 10 and 11.

GENERAL DESCRIPTION: Clast to matrix supported basaltic lapilli breccia.

COLOR: Grayish yellow green (5GY 7/2), dusky yellowish green (10GY 3/2), brownish gray (5YR 4/1), light brownish gray (5YR 6/1).

COMPONENTS: Angular to subround clasts of moderately to highly vesicular basalt and basaltic glass. The size of clasts varies from 2 mm to >60 mm. The basalt is highly altered and contains plagioclase and olivine phenocrysts (~1%) set in an aphanitic groundmass. Olivine is altered to dark green clay, but plagioclase appears unaltered. Glass clasts are moderately to highly vesicular and partially altered to dark green clay. The clasts are cemented by zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, clast to matrix supported. Gravel-size fragments (2-60 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

COMMENTS: Pieces 1, 11, and 12 contain unaltered glass.
197-1206A-26R-2 (cont'd) Section Top: 211.60 mbsf

UNIT 11G: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 12-19

CONTACTS: The contact between Subunits 11F and 11G is inferred to be at 74 cm, between Pieces 11 and 12.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

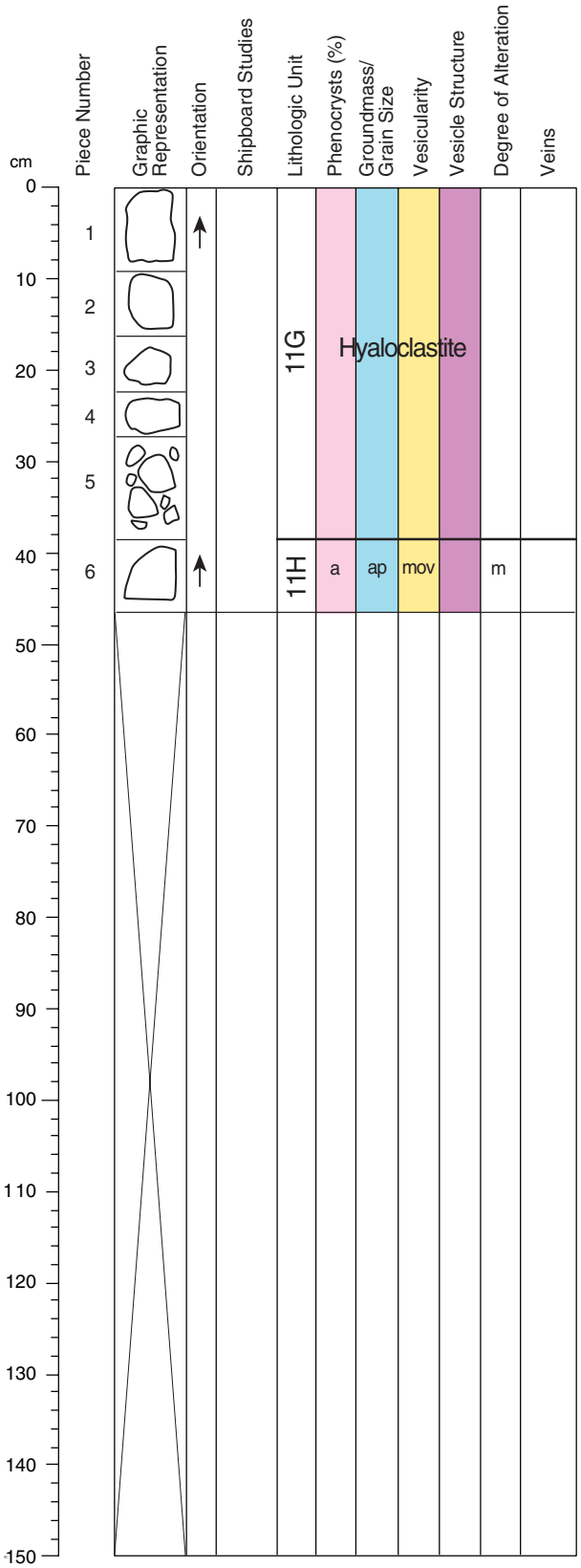
COLOR: Greenish black (5GY 2/1).

COMPONENTS: Angular clasts of highly vesicular basalt, and basaltic glass. The size of clasts varies from <2 mm to 45 mm. Fresh glass is present in the centers of some of the larger clasts, particularly Piece 12. Hemispherical orange crystals of zeolite, and gray-green clay infill cavities between clasts. Vesicles within the basalt clasts are lined with blue-gray clay.

SEDIMENTARY TEXTURES: Unsorted, clast supported. Clasts are <2 mm to 45 mm.

SEDIMENTARY STRUCTURES: Unbedded, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-26R-3 (Section top: 213.03 mbsf)

UNIT 11H: APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 6

CONTACTS: The contact between Subunits 11G and 11H is inferred to be between Pieces 5 and 6 at 38 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	2	0.5	1	Subhedral; equant
Plagioclase	<1	1.5	0.5	0.8	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	8	0.5	Round

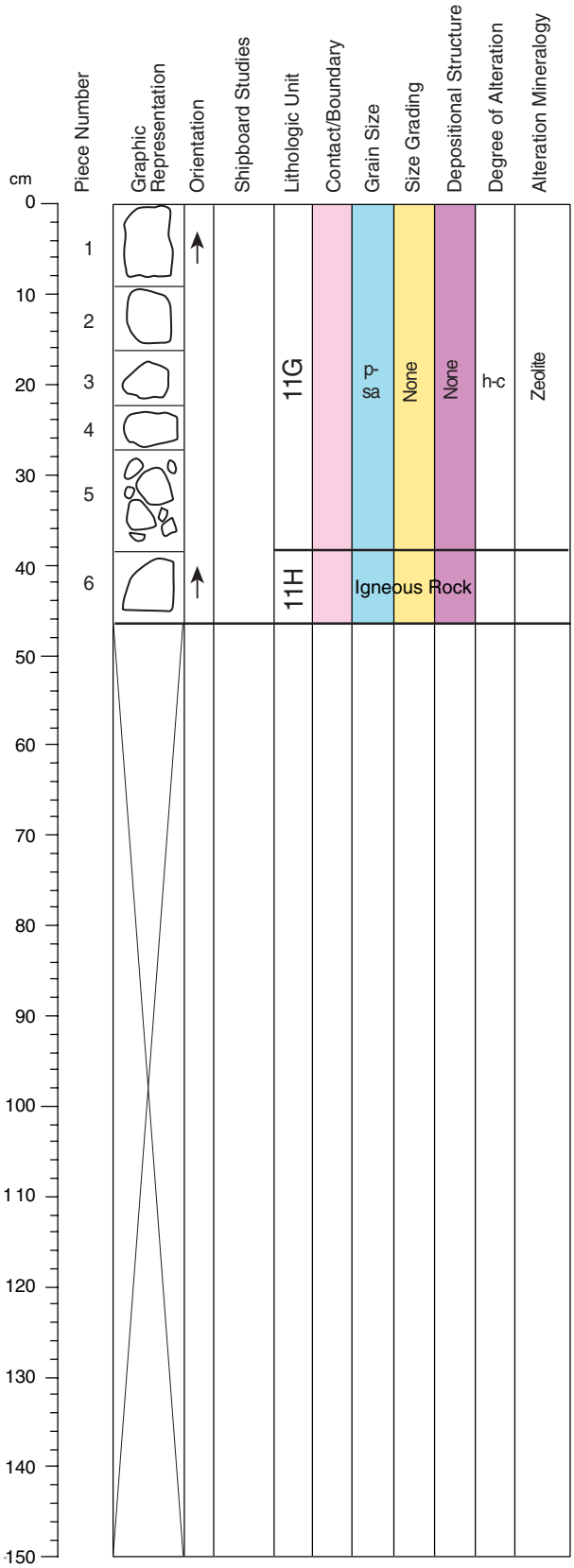
COLOR: Medium dark gray (N4).

STRUCTURE: Vesicular, lobed.

ALTERATION: Moderate. Olivine phenocrysts are partially to completely altered to Fe oxyhydroxide and gray-green clay. Vesicles are filled with carbonate, or partially filled with gray-green clay.

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-26R-3 (Section top: 213.03 mbsf)

UNIT 11G: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-5

CONTACTS: The contact between Subunits 11G and 11H is inferred to be at 38 cm, between Pieces 5 and 6.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia.

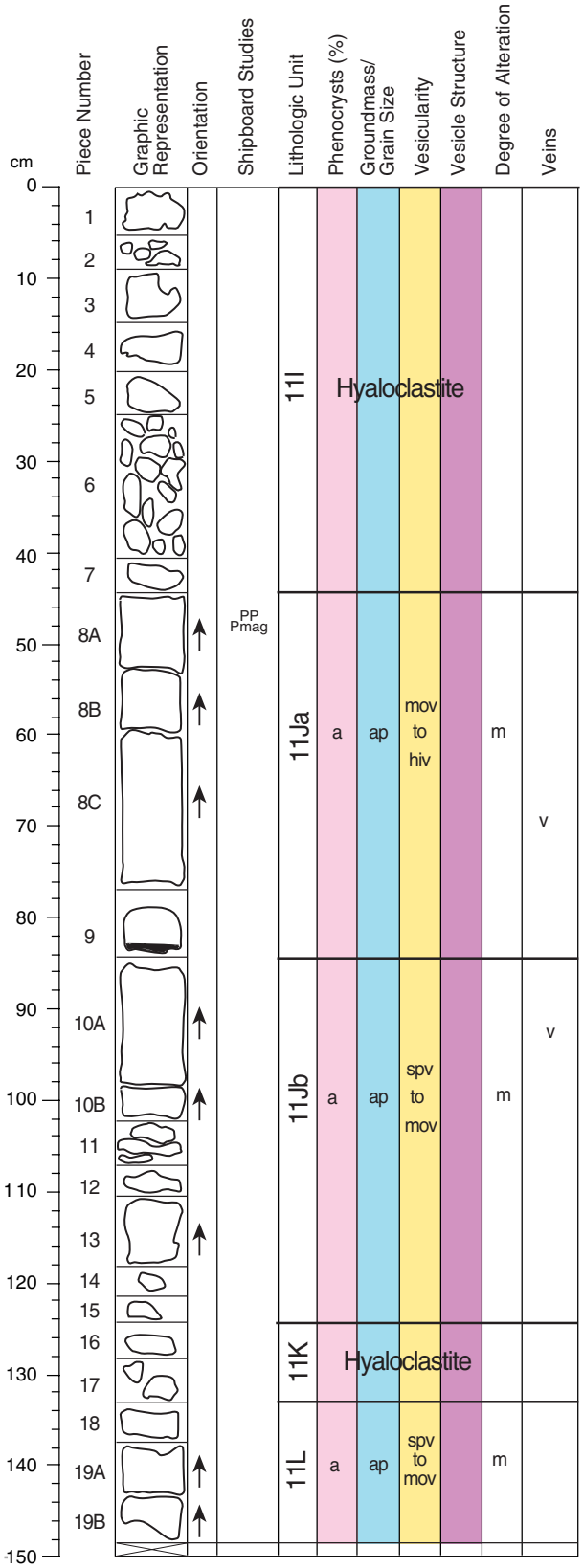
COLOR: Greenish black (5GY 2/1).

COMPONENTS: Angular clasts of highly vesicular basalt, and basaltic glass. The size of clasts varies from 2 mm to 40 mm. Fresh glass is present in the centers of some of the larger clasts. Hemispherical orange crystals of zeolite, and gray-green clay infill cavities between clasts. Vesicles within the basalt clasts are lined with blue-gray clay.

SEDIMENTARY TEXTURES: Unsorted, clast supported. Clasts size is 2 mm to 40 mm.

SEDIMENTARY STRUCTURES: Unbedded, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-27R-1 (Section top: 219.8 mbsf)

UNIT 11J: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 8-15

CONTACTS: The contact between Subunits 11I and 11J is inferred to be between Pieces 7 and 8 at 44 cm. The sharp contact between Subunits 11J and 11K is present in Piece 15 at 122 cm.

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxide, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
	5-25	1	Round

COLOR: Dark gray (N3).

STRUCTURE: Vesicular, lobed. Slightly altered glassy margin is present in Piece 9 at 82 cm.

ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with carbonate (44-50 cm), or most are filled with carbonate or light gray clay that swells when wet (50-83 cm), or most are filled with carbonate and greenish gray clay (83-122 cm).

VEINS/FRACTURES: Highly fractured. Fractures are random and irregular, 0.5-25 mm wide, and filled with carbonate and greenish gray clay.

COMMENTS: Vesicle abundance decreases downward in this subunit.

UNIT 11L: APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 18-19

CONTACTS: The contact between Subunits 11K and 11L is inferred to be at 133 cm, between Pieces 17 and 18. The top of Piece 18 is a glassy margin.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1	0.5	0.8	Subhedral; equant
Plagioclase	<1	1.5	0.5	1	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
	4-10	0.5	Rounded

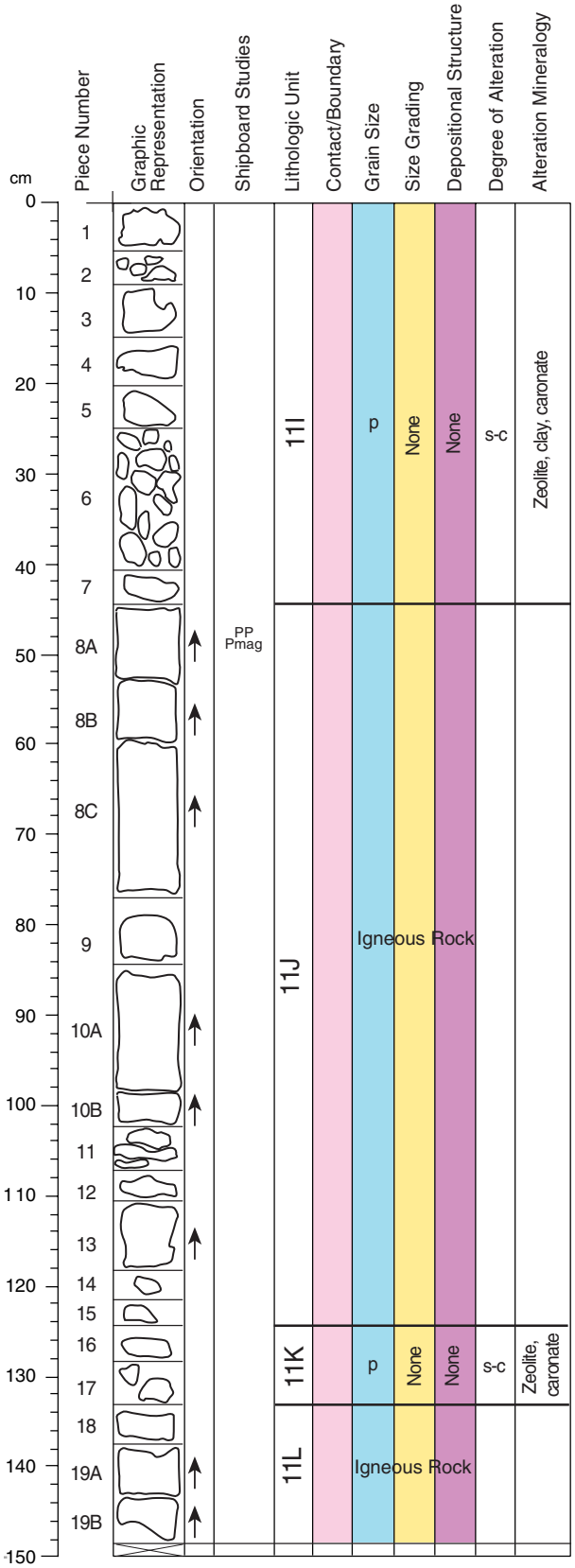
COLOR: Medium dark gray (N4).

STRUCTURE: Vesicular, lobed.

ALTERATION: Moderate. Olivine phenocrysts are partially to completely altered to Fe oxyhydroxide. Vesicles are partially to completely filled with carbonate, Fe oxyhydroxide, or zeolite, or lined with greenish-gray clay.

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-27R-1 (Section top: 219.8 mbsf)

UNIT 11I: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-7

CONTACTS: None observed. The top of Unit 11I is inferred to be at the top of Section 27R-1. The boundary between Subunits 11I and 11J (basalt) is inferred to be at 44 cm, between Pieces 7 and 8.

GENERAL DESCRIPTION: Clast to matrix supported basaltic lapilli breccia.

COLOR: Brownish gray (5YR 4/1), dark greenish gray (5GY 4/1), medium dark gray (N4).

COMPONENTS: Slightly to completely altered angular to subround clasts of highly vesicular basalt and basaltic glass. The size of clasts varies from 4 mm to 25 mm. The basalt is sparsely plagioclase-olivine-phyric and moderately vesicular. Olivine, 0.2-0.6 mm, is replaced by dark green clay (which also fills the vesicles) and Fe oxyhydroxide. Plagioclase, 0.5-2 mm, is unaltered. The cement is mainly zeolites, except in Piece 7 where it is carbonate.

SEDIMENTARY TEXTURES: Poorly sorted, clast to matrix supported. Gravel-size fragments (4-25 mm).

SEDIMENTARY STRUCTURES: Unbedded, massive.

COMMENTS: Piece 7 contains fragmented glass shards that are highly vesicular, suggesting quenching of the lava as it encountered wet carbonate sediment. Unaltered glass is present in Pieces 1, 3, and 7.

UNIT 11K: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 15-17

CONTACTS: The contact between Subunits 11J and 11K is in Piece 15 at 122 cm, where hyaloclastite basaltic breccia is in contact with carbonate sediment that fills fractures in the Subunit 11J basalt. The boundary between Subunits 11K and 11L (basalt) is inferred to be at 133 cm, between Pieces 17 and 18.

GENERAL DESCRIPTION: Matrix supported basaltic lapilli breccia.

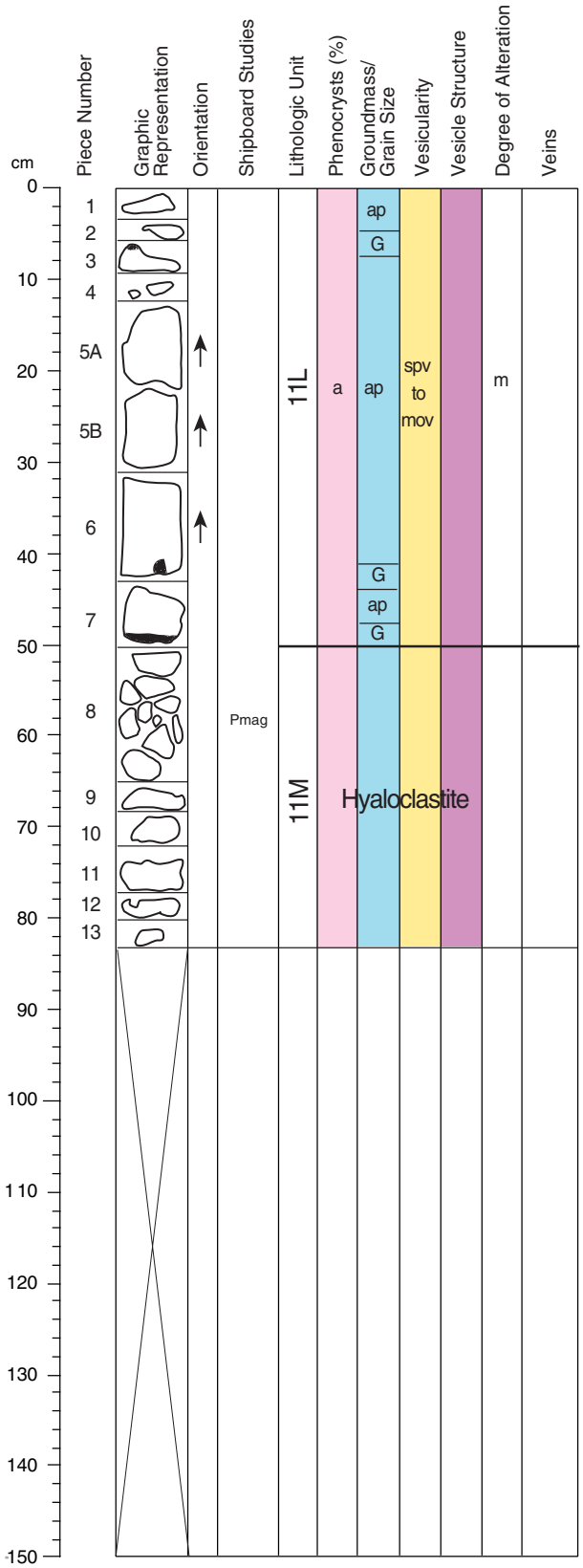
COLOR: Greenish black (5G 2/1) to dark greenish gray (5GY 4/1).

COMPONENTS: Very highly to completely altered angular to subround clasts of moderately to highly vesicular basalt and basaltic glass. The size of clasts varies from 5 mm to >30 mm. The basalt is sparsely plagioclase-olivine-phyric. Glass is completely altered to dark green clay. The cement is mainly carbonate with minor zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, clast supported. Gravel-size clasts (5-30 mm) in sand-size matrix.

SEDIMENTARY STRUCTURES: Unbedded, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-27R-2 (Section top: 221.27 mbsf)

UNIT 11L: APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-7

CONTACTS: The contact between Subunits 11L and 11M is inferred to be at 50 cm, between Pieces 7 and 8.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1	0.5	0.8	Subhedral; equant
Plagioclase	<1	1.5	0.5	1	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxide.

VESICLES:	% Mode	Size (mm): Average	Shape
	4-12	0.5	Rounded

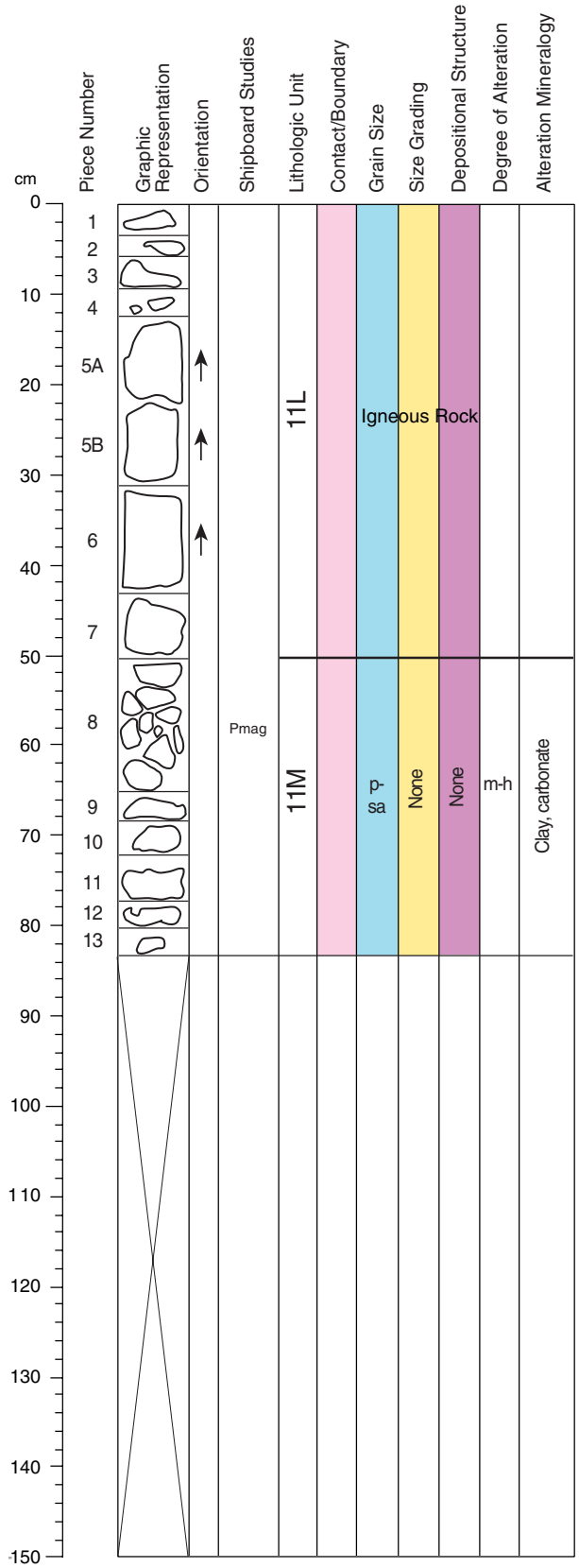
COLOR: Medium dark gray (N4).

STRUCTURE: Vesicular, lobed.

ALTERATION: Moderate. Olivine phenocrysts are partially to completely altered to Fe oxyhydroxide. Vesicles are partially to completely filled with carbonate, Fe oxyhydroxide, or brown-gray clay. Rare hemispherical orange crystals of zeolite are present in Piece 6. Glass in Pieces 6 and 7 is partially altered.

VEINS/FRACTURES: None.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-27R-2 (Section top: 221.27 mbsf)

UNIT 11M: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 8-13

CONTACTS: The contact between Subunits 11L and 11M is inferred to be at 50 cm, between Pieces 7 and 8.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia, with carbonate and zeolite cement.

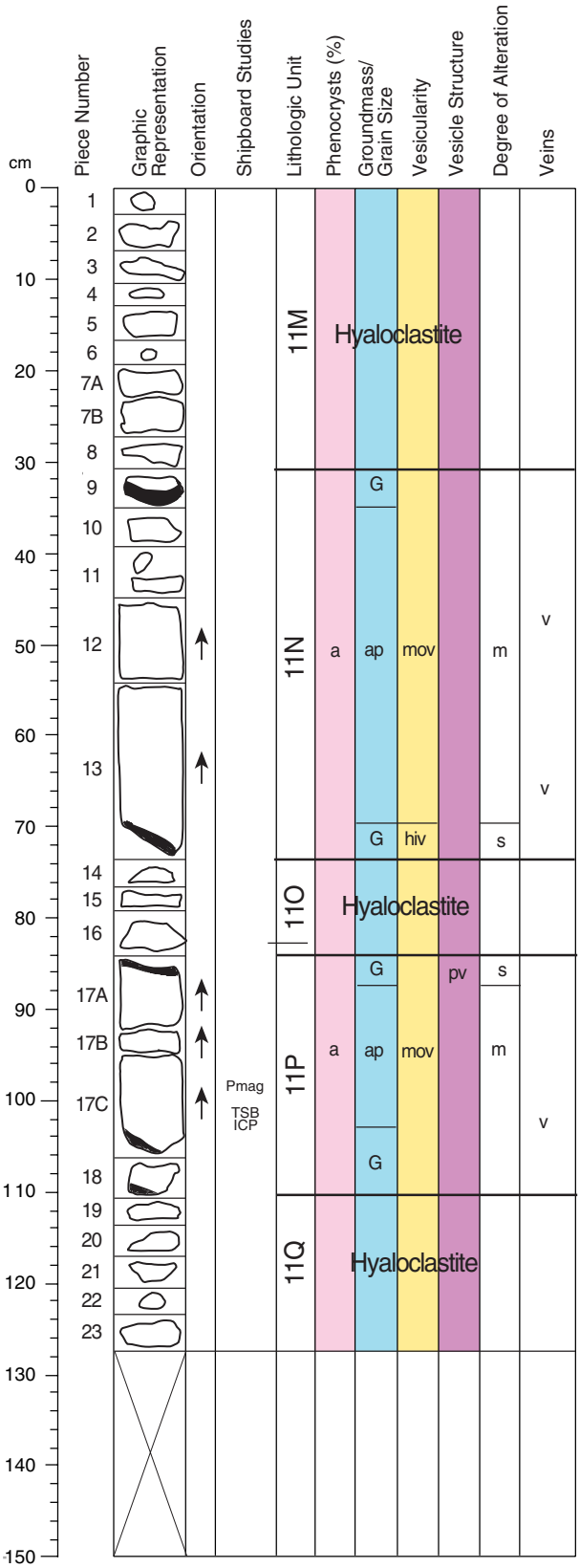
COLOR: Greenish black (5GY 2/1) to medium dark gray (N4).

COMPONENTS: Angular clasts of highly vesicular basalt and basaltic glass, with a cement of carbonate and zeolite. Occasional altered crystals of olivine up to 0.5 mm in diameter. The size of basaltic clasts varies from 2 mm to 70 mm. Unaltered glass is present in the centers of some of the larger clasts. Vesicles in the basalt clasts are partially filled with green-gray clay, zeolite and carbonate.

SEDIMENTARY TEXTURES: Poorly sorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-28R-1 (Section top: 224.0 mbsf)

UNIT 11N: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 9-13

CONTACTS: None observed. The boundary between Subunits 11M (hyaloclastite basalt lapilli breccia) and 11N is inferred to be at 30 cm between Pieces 8 and 9. Glass adheres to breccia on one side of Piece 9, but as this is an unoriented piece, the boundary has been placed between Pieces 8 and 9. The boundary between Subunits 11N and 11O (hyaloclastite lapilli breccia) is inferred to be at 73 cm between Pieces 13 and 14 because glass is present at the bottom of Piece 13.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1.5	0.5	1	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:

% Mode	Size (mm): Average	Shape
10-15	0.5	Round

COLOR: Medium dark gray (N4) to light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Partially altered glassy lobe margins are present in Pieces 9 and 13.

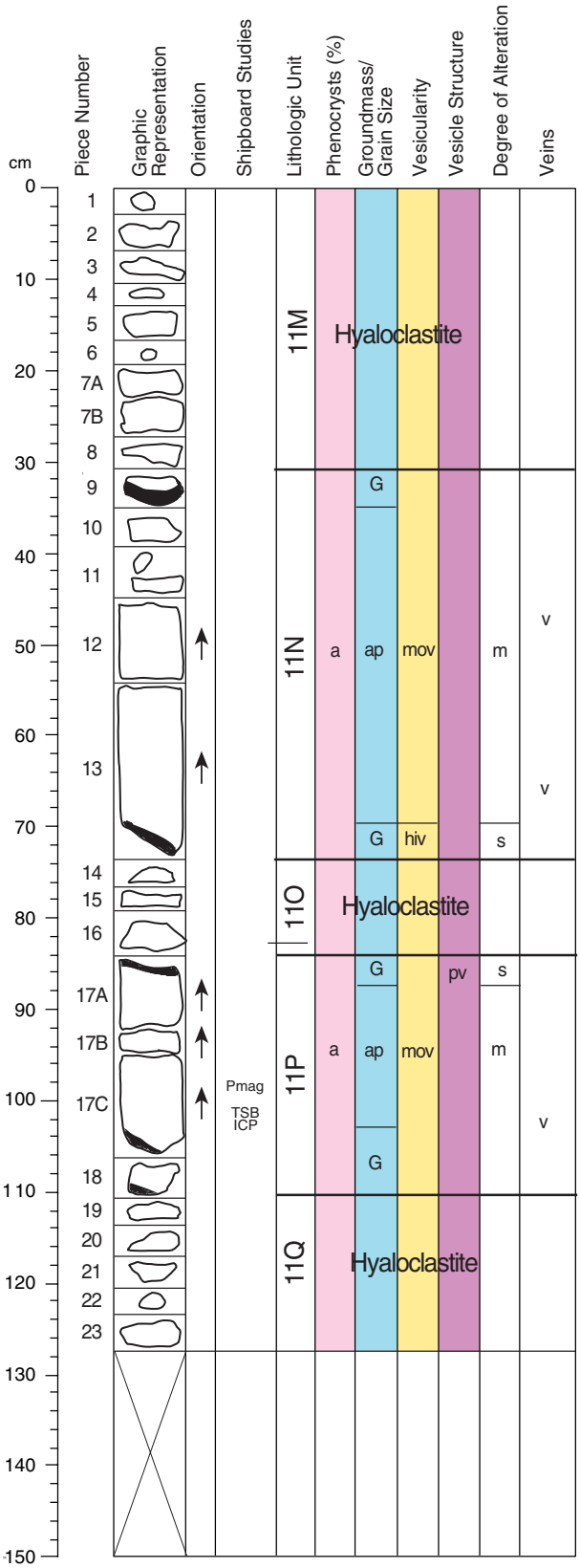
ALTERATION: Slight to moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green clay.

VEINS/FRACTURES: Sparsely veined and fractured. Veins are oriented perpendicular to the lobe margin, <0.1-1 mm wide and filled with white carbonate and dark green clay.

COMMENTS: Subunit 11N may extend to Piece 6. Unaltered glass is present in the lobe margins of Pieces 9 and 13.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-28R-1 (Continued)

UNIT 11P: APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 17A-18

CONTACTS: None observed. The boundary between Subunits 11O (hyaloclastite basalt lapilli breccia) and 11P is inferred to be at 83 cm between Pieces 16 and 17A. The boundary between Subunits 11P and 11Q (hyaloclastite basalt lapilli breccia) is inferred to be at 111 cm between Pieces 18 and 19.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	2	0.5	1	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	10-15	0.5	Round

COLOR: Medium dark gray (N4) to light brownish gray (5YR 6/1).

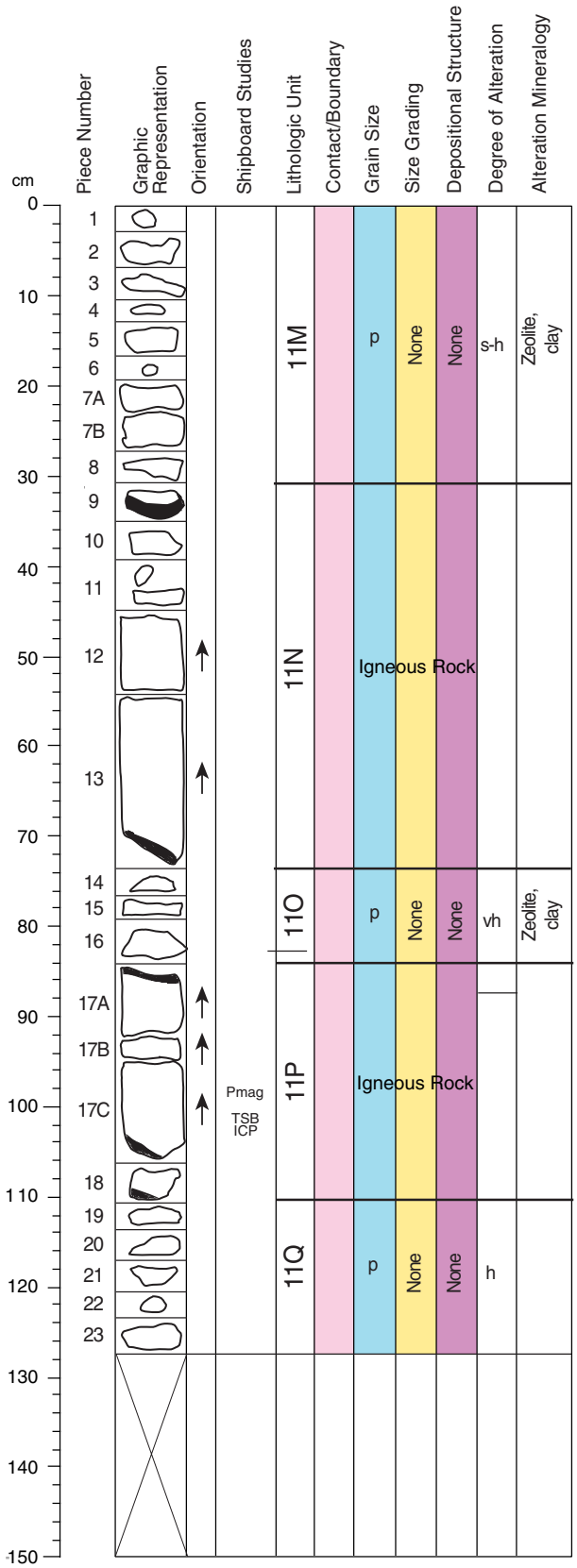
STRUCTURE: Lobed. Partially altered glassy lobe margins are present in Pieces 17A, 17C, and 18.

ALTERATION: Slight to moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green clay.

VEINS/FRACTURES: Sparsely veined. Veins are randomly oriented, <0.1-2 mm wide and filled with white carbonate and green clay.

COMMENTS: Olivine microphenocrysts may be present but are replaced by the same material that fills the vesicles, making positive identification difficult. Pipe vesicles are present in Piece 17A (~1 cm long) filled with white carbonate. Unaltered glass is present in the lobe margins of Pieces 17A, 17C, and 18.

Core Photo



VOLCANICLASTIC ROCK VISUAL CORE DESCRIPTION

197-1206A-28R-1 (Section top: 224.0 mbsf)

UNIT 11M: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-8

CONTACTS: None observed. The boundary between Subunits 11M and 11N (basalt) is inferred to be at 30 cm between Pieces 8 and 9.

GENERAL DESCRIPTION: Highly to completely altered, matrix supported basalt lapilli breccia.

COLOR: Dusky green (5G 3/2), brownish gray (5YR 4/1).

COMPONENTS: Angular to subround, moderately to highly altered basalt clasts (~1 cm to >7 cm) contain portions of completely altered glassy lobe margins. Basalt is aphyric to sparsely plagioclase-olivine-phyric, and highly vesicular. Vesicles are round, ~0.5 mm, partially filled with gray-green clay. Smaller clasts (≤1 cm) are highly vesicular glass that has been completely altered to green clays and several have been replaced by zeolites and Fe oxyhydroxide. The matrix contains carbonate, mineral and lithic fragments, as well as zeolite.

SEDIMENTARY TEXTURES: Unsorted. Gravel-size clasts in silt- to sand-size matrix.

SEDIMENTARY STRUCTURES: Massive.

COMMENTS: This is a continuation of Subunit 11M from Section 27R-2. A pipe vesicle in the basalt clast in Piece 7A is partially filled with zeolite. Large clasts of fragmented lava lobes are present in Pieces 7A, 7B, 8, and 9.

UNIT 11O: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 14-16

CONTACTS: None observed. The boundary between Subunits 11N (basalt) and 11O is inferred to be at 74 cm between Pieces 13 and 14. The boundary between Subunits 11O and 11P (basalt) is inferred to be at 74 cm between Pieces 13 and 14.

GENERAL DESCRIPTION: Highly to completely altered, matrix supported basalt lapilli breccia.

COLOR: Dusky green (5G 3/2), dark greenish gray (5GY 4/1).

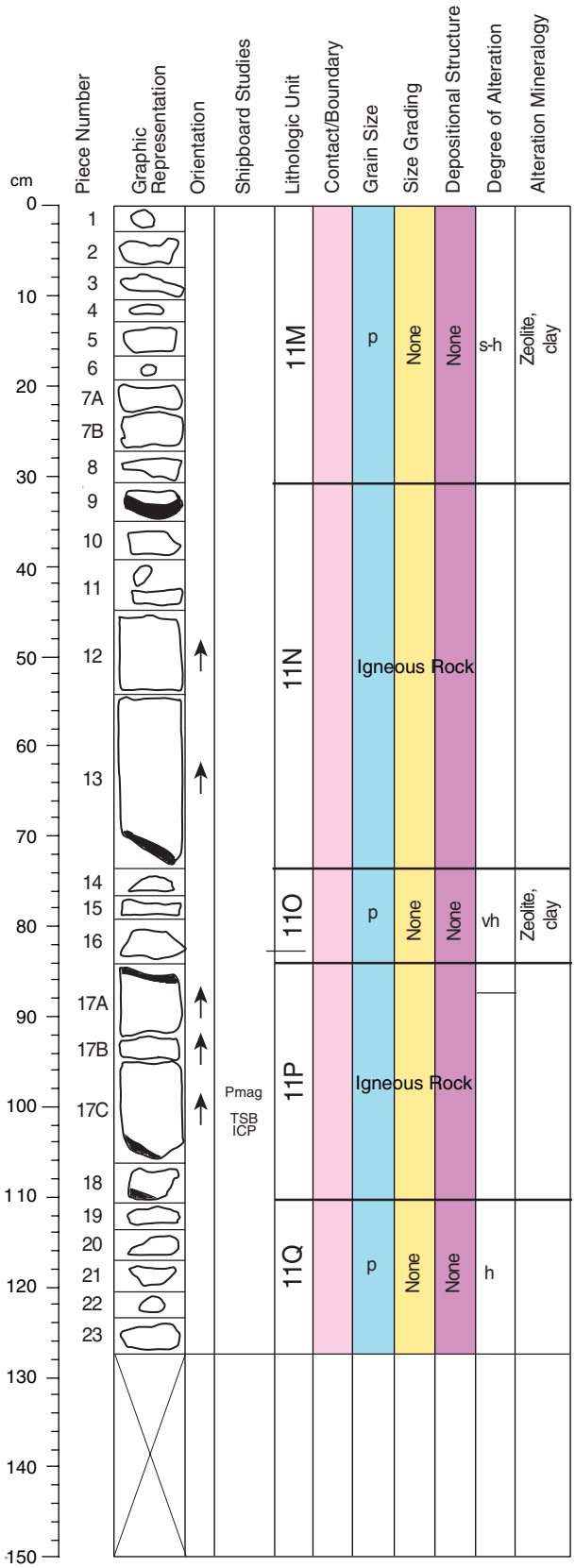
COMPONENTS: Angular to subround, moderately to highly vesicular (10%-25%) glass clasts (3-20 mm) that has been completely altered to green clays and several have been replaced by zeolite (e.g., Piece 16). Rare basalt clasts (≤1 cm) are aphyric and nonvesicular. The matrix contains carbonate, mineral and lithic fragments, as well as zeolite.

SEDIMENTARY TEXTURES: Unsorted. Gravel-size clasts in silt- to sand-size matrix.

SEDIMENTARY STRUCTURES: Massive.

(Continued on next page.)

Core Photo



VOLCANICLASTIC ROCK VISUAL CORE DESCRIPTION

197-1206A-28R-1 (Continued)

UNIT 11Q: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 19-23

CONTACTS: The contact between Subunits 11P and 11Q is inferred to be at 111 cm between Pieces 18 and 19.

GENERAL DESCRIPTION: Highly altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Dark greenish gray (5G 4/1) to black.

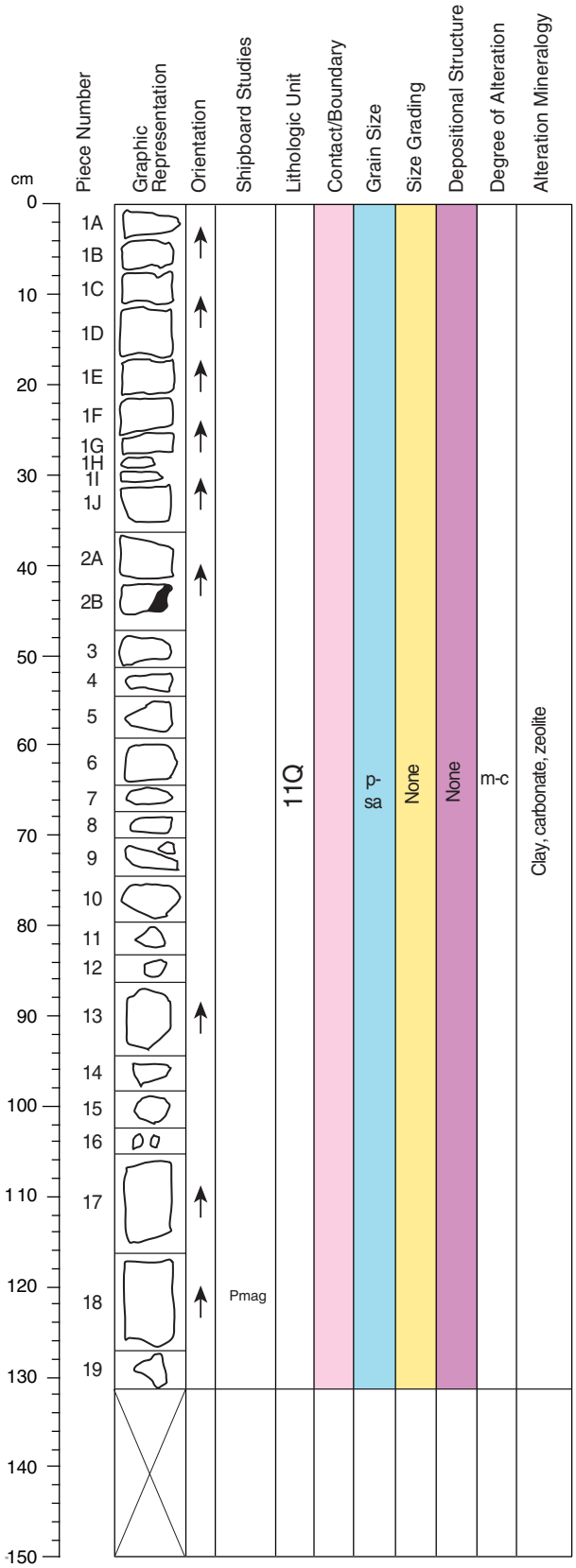
COMPONENTS: Consists of angular clasts of highly vesicular basalt and basaltic glass (occasionally unaltered), with a cement of dark green clay, carbonate and zeolite. Clasts are up to 25 mm in diameter. Vesicles within the basaltic clasts are partially filled with carbonate or green-gray clay.

SEDIMENTARY TEXTURES: Unsorted, clast supported. Clasts are up to 25 mm in diameter.

SEDIMENTARY STRUCTURES: None, massive.

COMMENTS: Several of the larger clasts consist of unaltered glass.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-28R-2 (Section top: 225.28 mbsf)

UNIT 11Q: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-19

CONTACTS: None.

GENERAL DESCRIPTION: Highly altered, clast supported hyaloclastite basalt lapilli breccia. The interval 1 to 47 cm is composed of aphyric, moderately vesicular basalt, which is interpreted as a large clast. Fractures within this basaltic clast are filled with laminated sandstone.

COLOR: Breccia: dark greenish gray (5G 4/1). Basalt: medium dark gray (N4). Sandstone: greenish gray (5GY 6/1).

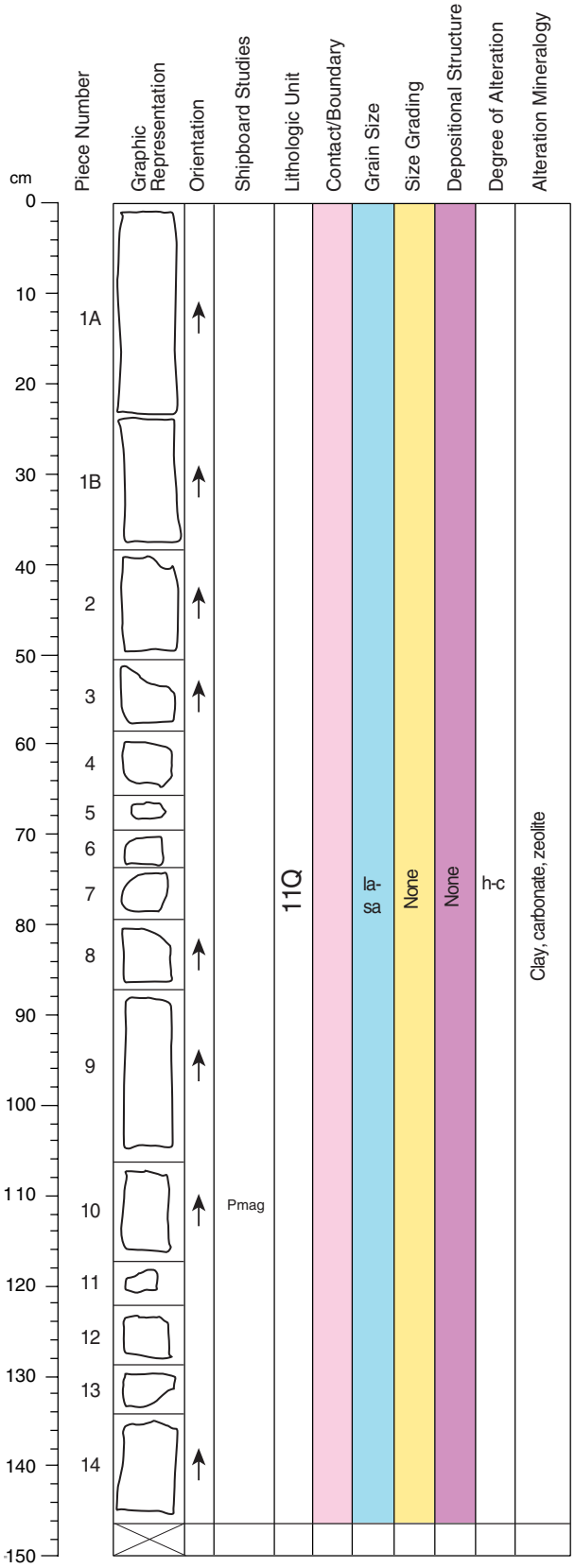
COMPONENTS: Angular clasts of highly vesicular basalt and basaltic glass (occasionally unaltered), with a cement of dark green clay, carbonate and zeolite. Pieces 1 and 2 are composed of aphyric (very rare 1-mm-sized plagioclase phenocrysts), sparsely vesicular basalt. A moderately well-sorted, finely laminated sandstone fills fractures within the basalt in Piece 1, and is composed of rounded particles of altered basaltic glass, feldspar and lithic fragments.

SEDIMENTARY TEXTURES: The breccia is unsorted and clast supported. Sandstone in Piece 1 is moderately well sorted.

SEDIMENTARY STRUCTURES: Breccia: none, massive. The sandstone in Piece 1 is finely laminated.

COMMENTS: Pieces 1 and 2 (aphyric basalt and sandstone) are interpreted to be part of a large clast, on the basis of the lack of chilled margins in the basalt, and the non-horizontal (~40°) dip of the lamination in the sandstone. Some fresh glass is present in Piece 1A.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-28R-3 (Section top: 226.59 mbsf)

UNIT 11Q: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-14

CONTACTS: None.

GENERAL DESCRIPTION: Highly altered, clast supported hyaloclastite basalt lapilli breccia.

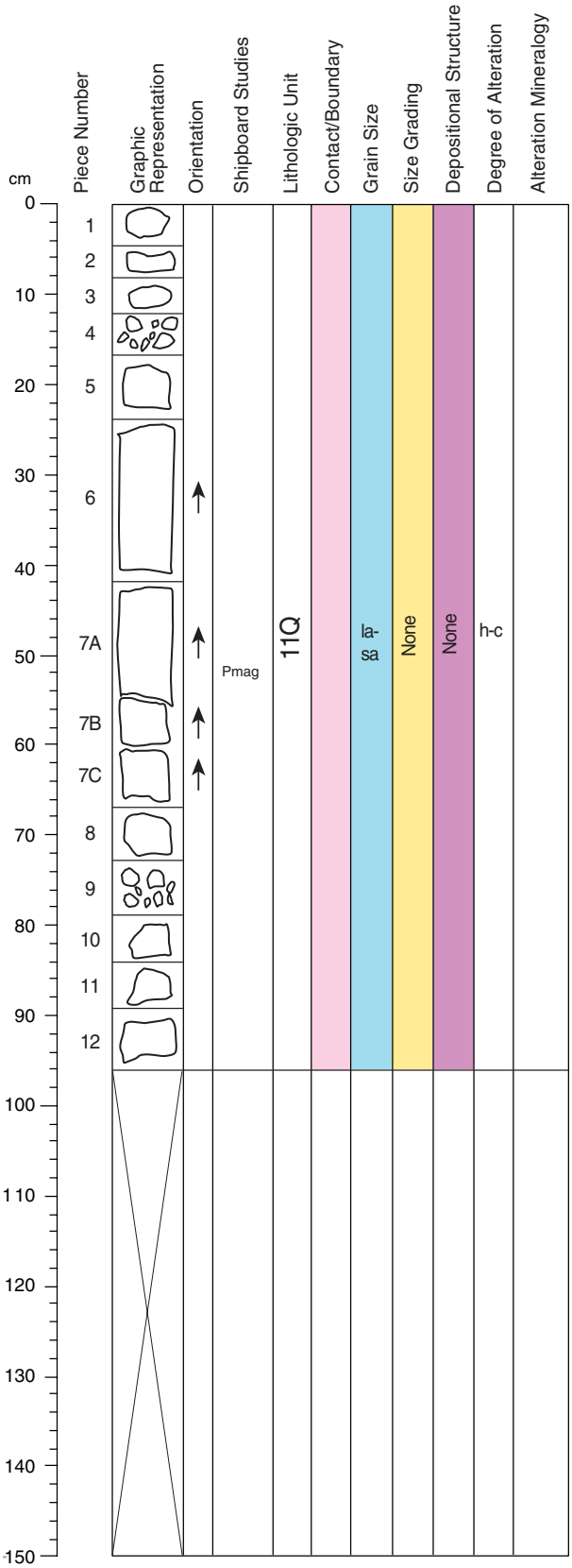
COLOR: Rare clasts larger than 20 mm are pale yellowish brown (10 YR 6/2). All other clasts have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular aphyric basalt and basaltic glass, with a cement of dark green clay and zeolite. Clasts larger than 20 mm are highly altered and have vesicles partially filled with green-gray clay. Clasts smaller than 20 mm are completely altered.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-28R-4 (Section top: 228.05 mbsf)

UNIT 11Q: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-12

CONTACTS: None.

GENERAL DESCRIPTION: Highly altered, clast supported hyaloclastite basalt lapilli breccia.

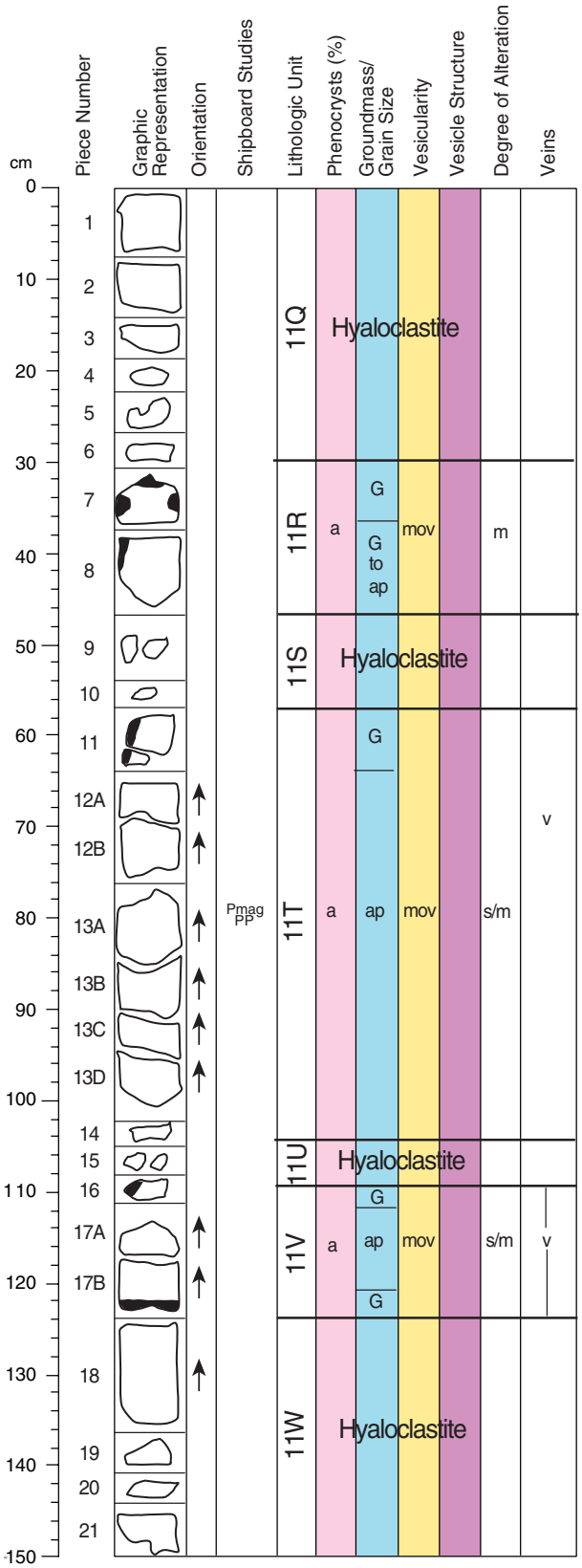
COLOR: Rare clasts larger than 20 mm are pale yellowish brown (10 YR 6/2). All other clasts have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular aphyric basalt and basaltic glass, with a cement of dark green clay and zeolite. Clasts larger than 20 mm are highly altered and have vesicles partially filled with green-gray clay. Clasts smaller than 20 mm are completely altered.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-29R-1 (Section top: 229.6 mbsf)

UNIT 11R: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 7-8

CONTACTS: None observed. The boundary between Subunits 11Q (hyaloclastite basalt lapilli breccia) and 11R (aphyric basalt) is inferred to be at 30 cm between Pieces 6 and 7.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1.5	0.5	1	Subhedral laths
Olivine:	<<1	1.5	0.5	1	Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	20	0.5	Round to irregular

COLOR: Brownish gray (5YR 4/1) to light brownish gray (5YR 6/1).

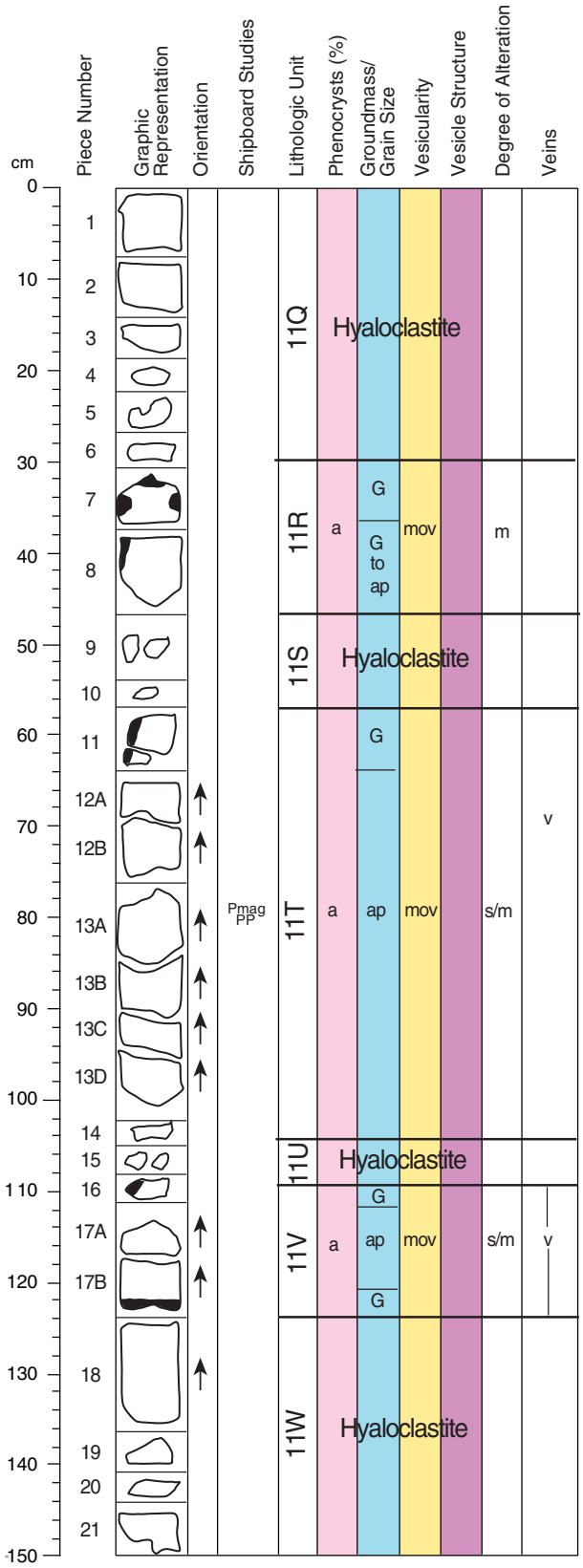
STRUCTURE: Lobed. Lobe margins are present in Pieces 7 at 30 cm and 13 at 47 cm, based on the presence of unaltered glass.

ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Olivine phenocrysts are partially altered to Fe oxyhydroxide. Vesicles are filled with green clay, carbonate and zeolite.

VEINS/FRACTURES: Sparsely fractured. <1 mm wide cube jointed fractures are present in Piece 7.

(Continued on next page)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-29R-1 (Continued)

UNIT 11T: APHYRIC TO SPARSLEY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 11-14

CONTACTS: None observed. The boundary between Subunits 11S (hyaloclastite basalt lapilli breccia) and 11T (aphyric basalt) is inferred to be at 57 cm between Pieces 10 and 11.

PHENOCRYSTS:	%	Grain Size (mm)			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1.5	0.5	1	Subhedral laths
Olivine:	<<1	1.5	0.5	1	Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margin. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	%	Size (mm)	
	Mode	Avg.	Shape
Moderately vesicular	20	0.5	Round to irregular

COLOR: Brownish gray (5YR 4/1) to light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Lobe margin is present in Piece 11 at 57 cm, based on the presence of unaltered glass.

ALTERATION: Slight to moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Olivine phenocrysts are partially altered to Fe oxyhydroxide. Vesicles are filled with green clay, carbonate and zeolite.

VEINS/FRACTURES: Sparsely veined. ~1 mm wide, randomly oriented veins are present in Piece 12B, and are filled with carbonate.

UNIT 11V: APHYRIC TO SPARSLEY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 16-17

CONTACTS: None observed. The boundary between Subunits 11U (hyaloclastite basalt lapilli breccia) and 1V (aphyric basalt) is inferred to be at 108 cm between Pieces 15 and 16.

PHENOCRYSTS:	%	Grain Size (mm)			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1.5	0.5	1	Subhedral laths
Olivine:	<<1	1.5	0.5	1	Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	%	Size (mm)	
	Mode	Avg.	Shape
Moderately vesicular	20	0.5	Round to irregular

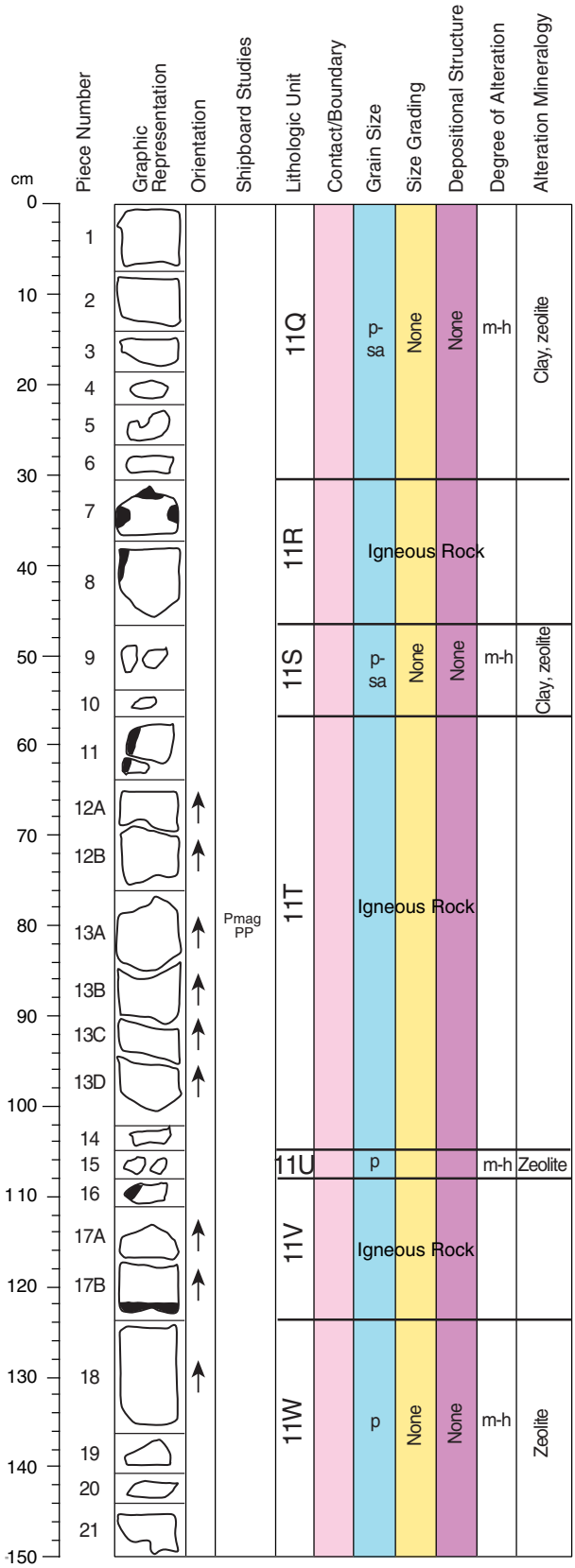
COLOR: Brownish gray (5YR 4/1) to light brownish gray (5YR 6/1).

STRUCTURE: Lobed. Lobe margins are present in Pieces 16 at 108 cm and 17 at 124 cm, based on the presence of unaltered glass.

ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Olivine phenocrysts are partially altered to Fe oxyhydroxide. Vesicles are filled with green clay, carbonate and zeolite.

VEINS/FRACTURES: Moderately veined. ~1 mm wide cube jointed veins are present in Pieces 16 and 17, and are filled with carbonate.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-29R-1 (Section top: 229.6 mbsf)

UNIT 11Q: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-6

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported basalt lapilli breccia that is cemented by zeolite.

COLOR: Varied. Large clasts (>10 mm) are dusky yellow (5Y 6/4), brownish gray (5 YR 4/1) or dark greenish gray (5G 4/1), and small clasts (<10 mm) are grayish black (N2), white (N9) and dark greenish gray (5G 4/1).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 30 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Rarely some of them are relatively less altered, and are dark greenish gray (5G 4/1), and can be recognized as aphyric basalt. Some large clasts, with a size between 10 mm to 30 mm, are altered to dusky yellow (5Y 6/4) clay. Some relatively less altered clasts are dark greenish gray (5G 4/1) or brownish gray (5 YR 4/1), and can be recognized as aphyric basalt. The cement is zeolite. The vesicles in the clasts are filled with dark green or white clay and zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-30 mm.

SEDIMENTARY STRUCTURES: Massive.

UNIT 11S: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 9-10

CONTACTS: The boundary between Subunit 11R (aphyric basalt) and 11S (hyaloclastite basaltic lapilli breccia) is inferred to be between Pieces 8 and 9 at 47 cm.

GENERAL DESCRIPTION: Clast supported basaltic lapilli breccia that is cemented by zeolite.

COLOR: Varied. Large clasts (>10 mm) are dusky yellow (5Y 6/4), brownish gray (5 YR 4/1) or dark greenish gray (5G 4/1), and small clasts (<10 mm) are grayish black (N2), white (N9) and dark greenish gray (5G 4/1).

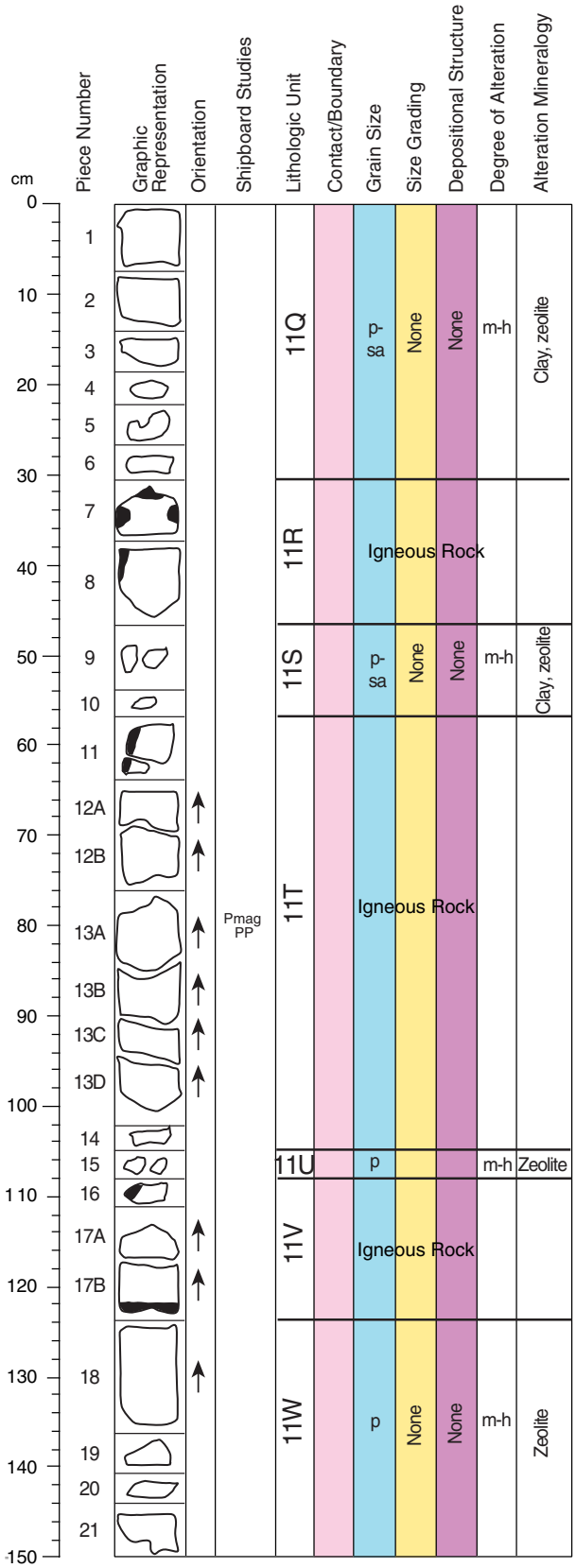
COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 70 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Rarely some of them are relatively less altered, and are dark greenish gray (5G 4/1) in color, and can be recognized as aphyric basalt. Some large clasts, with a size between 10 mm to 70 mm, are altered to dusky yellow (5Y 6/4) clay. Some relatively less altered clasts are dark greenish gray (5G 4/1) or brownish gray (5 YR 4/1), and can be recognized as aphyric basalt. The cement is zeolite. The vesicles in the clasts are filled with dark green or white clay and zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-70 mm.

SEDIMENTARY STRUCTURES: Massive.

(Continued on next page.)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-29R-1 (Section top: 229.6 mbsf)

UNIT 11U: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 15

CONTACTS: The boundary between Subunit 11T (aphyric basalt) and 11U (hyaloclastite basalt lapilli breccia) is inferred between Pieces 14 and 15 at 105 cm.

GENERAL DESCRIPTION: Clast supported basalt lapilli breccia that is cemented by zeolite.

COLOR: Varied. Grayish black (N2), white (N9) and dark greenish gray (5G 4/1).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 10 mm. Clasts are highly altered to grayish black (N2) or white (N9) clay. Rarely some of them are relatively less altered, and are dark greenish gray (5G 4/1) in color, and can be recognized as aphyric basalt. The cement is zeolite. The vesicles in the clasts are filled with dark green or white clay and zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-10 mm.

SEDIMENTARY STRUCTURES: Massive.

UNIT 11W: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 18-21

CONTACTS: The boundary between Subunit 11V (aphyric basalt) and 11W (hyaloclastite basalt lapilli breccia) is inferred to be between Pieces 17B and 18 at 124 cm.

GENERAL DESCRIPTION: Clast supported basalt lapilli breccia that is cemented by zeolite.

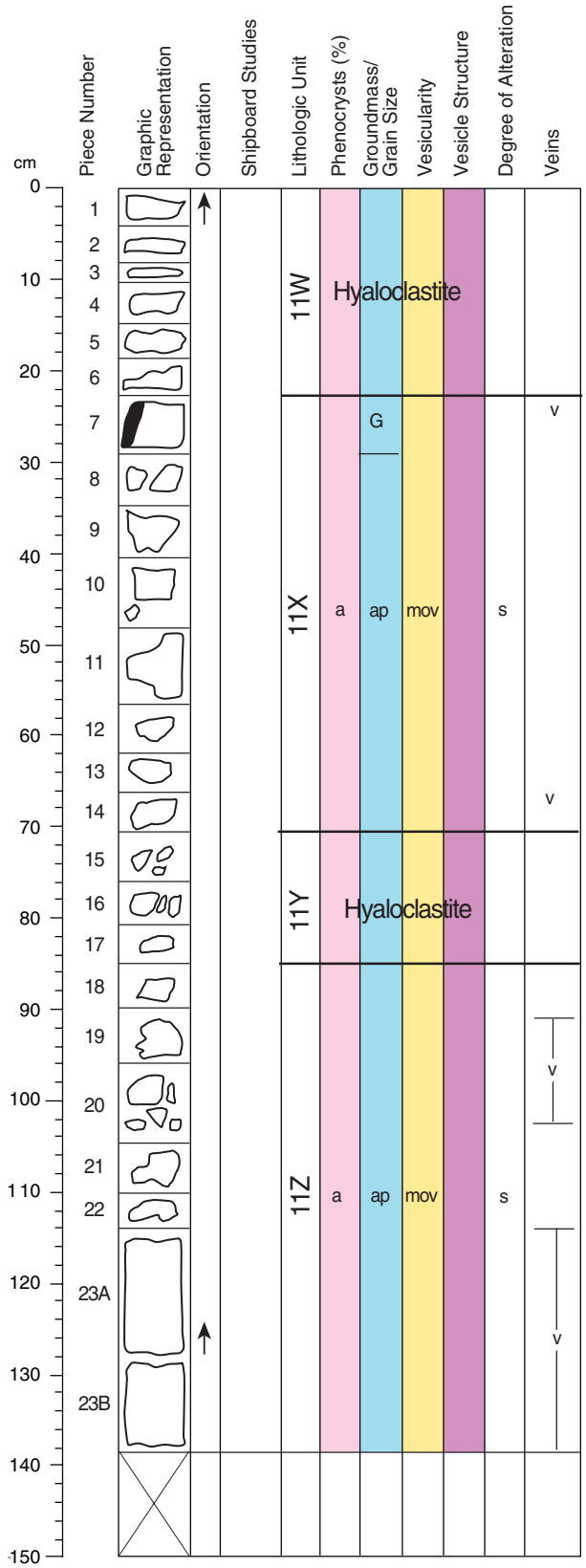
COLOR: Varied. Large clasts (>10 mm) are dusky yellow (5Y 6/4), brownish gray (5 YR 4/1) or dark greenish gray (5G 4/1), and small clasts (<10 mm) are grayish black (N2), white (N9) and dark greenish gray (5G 4/1).

COMPONENTS: Angular clasts of highly vesicular basalt. The size of clasts varies from 2 mm to 30 mm. Small clasts, with a size between 2 mm to 10 mm, are highly altered to grayish black (N2) or white (N9) clay. Rarely some of them are relatively less altered, and are dark greenish gray (5G 4/1) in color, and can be recognized as aphyric basalt. Some large clasts, with a size between 10 mm to 30 mm, are altered to dusky yellow (5Y 6/4) clay. Some relatively less altered clasts are dark greenish gray (5G 4/1) or brownish gray (5 YR 4/1), and can be recognized as aphyric basalt. The cement is zeolite. The vesicles in the clasts are filled with dark green or white clay and zeolite.

SEDIMENTARY TEXTURES: Unsorted and clast supported. Clast size is between 2-30 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-29R-2 (Section top: 231.1 mbsf)

UNIT 11X: 29 APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 7-14

CONTACTS: None observed. The boundary between 11W (hyaloclastite) and the lobe forming Subunit 11X is between Pieces 6 and 7. The contact with Subunit 11Y (aphyric basalt) is between Pieces 14 and 15.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1	0.5	0.75	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	0.5	Round

COLOR: Medium gray (N5).

STRUCTURE: Lobed. A glassy lobe margin is present along the edge of Piece 7.

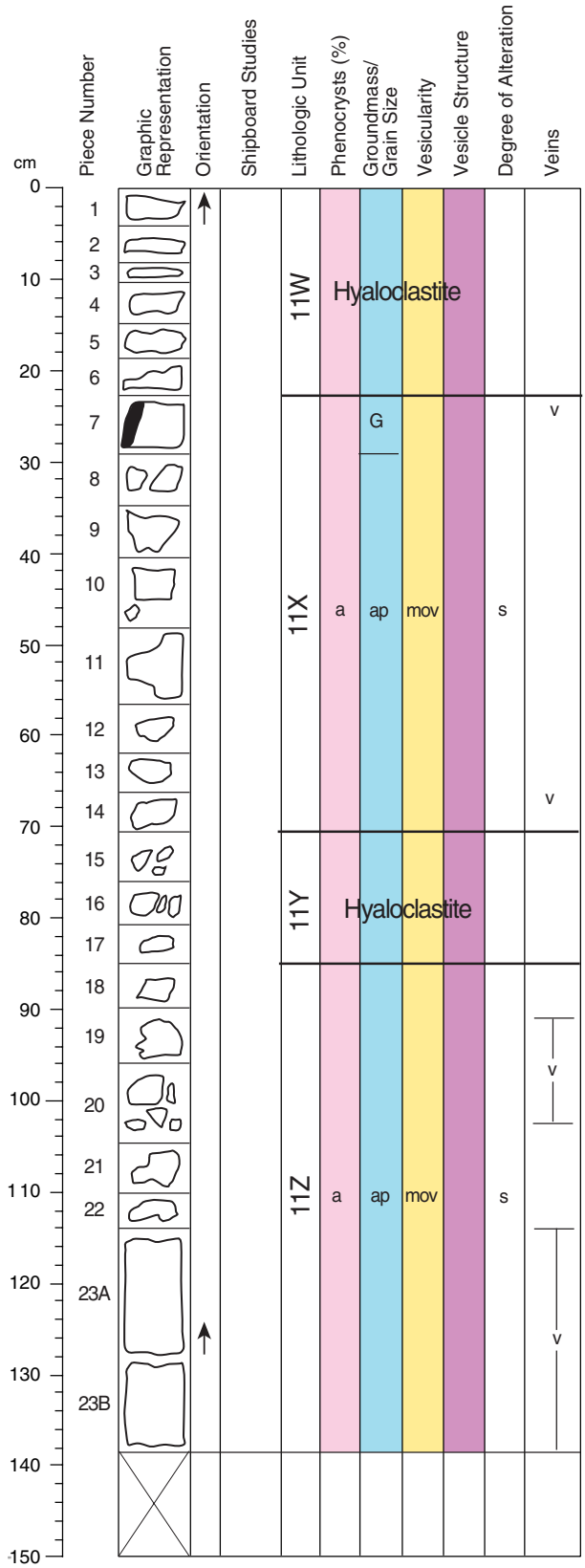
ALTERATION: Slight. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green or gray clay. Piece 10 displays a blue alteration coating. Olivine, if present (see note in comments section) is altered to green clay (celadonite).

VEINS/FRACTURES: Sparsely veined and fractured. Veins and filled fractures (<0.5 mm wide) are filled with white carbonate and dark green clay.

COMMENTS: Based on the angular and euhedral morphology, olivine (~1 mm) may occur at the 1% level, but it is difficult to identify since it has the same dark green color as the filled vesicles. This subunit represents an entire lobe. Piece 12 is a hyaloclastite dropstone.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-29R-2 (Continued)

UNIT 11Z: 29 APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 18-23

CONTACTS: None observed. The boundary between Subunit 11Y (hyaloclastite) and Subunit 11Z is between Pieces 17 and 18.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1	0.5	0.75	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	0.5	Round

COLOR: Medium gray (N5).

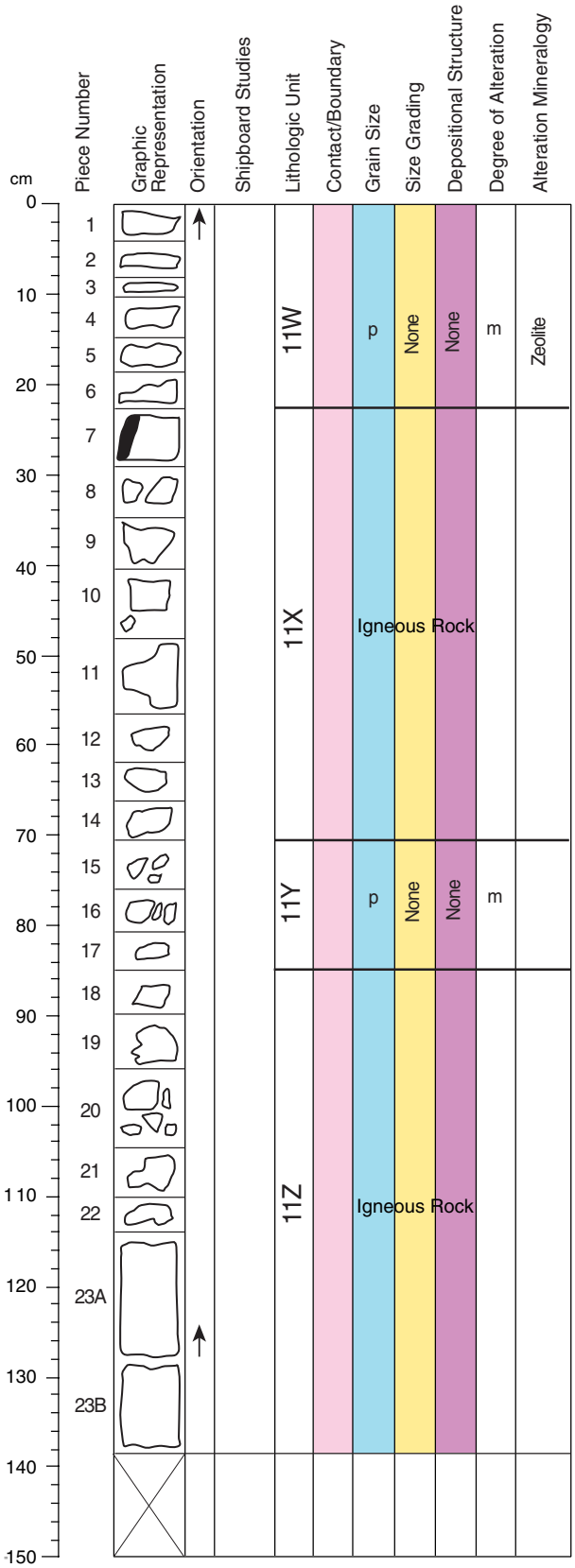
STRUCTURE: Lobed.

ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green or gray clay.

VEINS/FRACTURES: Sparsely veined and fractured. Veins and filled fractures (<0.5 mm wide) are filled with white carbonate and dark green clay. In Piece 23 a polygonal pattern of veins/fractures is present and reflects an enhanced cooling rate of the lava.

COMMENTS: Based on the angular and euhedral morphology, olivine (~1 mm) may occur at the 1% level, but it is difficult to identify since it has the same dark green color as the filled vesicles.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-29R-2 (Section top: 231.1 mbsf)

UNIT 11W: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-6

CONTACTS: None. The boundary between 11W and the basalt lobe forming Subunit 11X is between Pieces 6 and 7.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-10 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 11Y: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 15-17

CONTACTS: None. The boundary between 11Y and the aphyric basalt of Subunit 11X is between Pieces 17 and 18.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

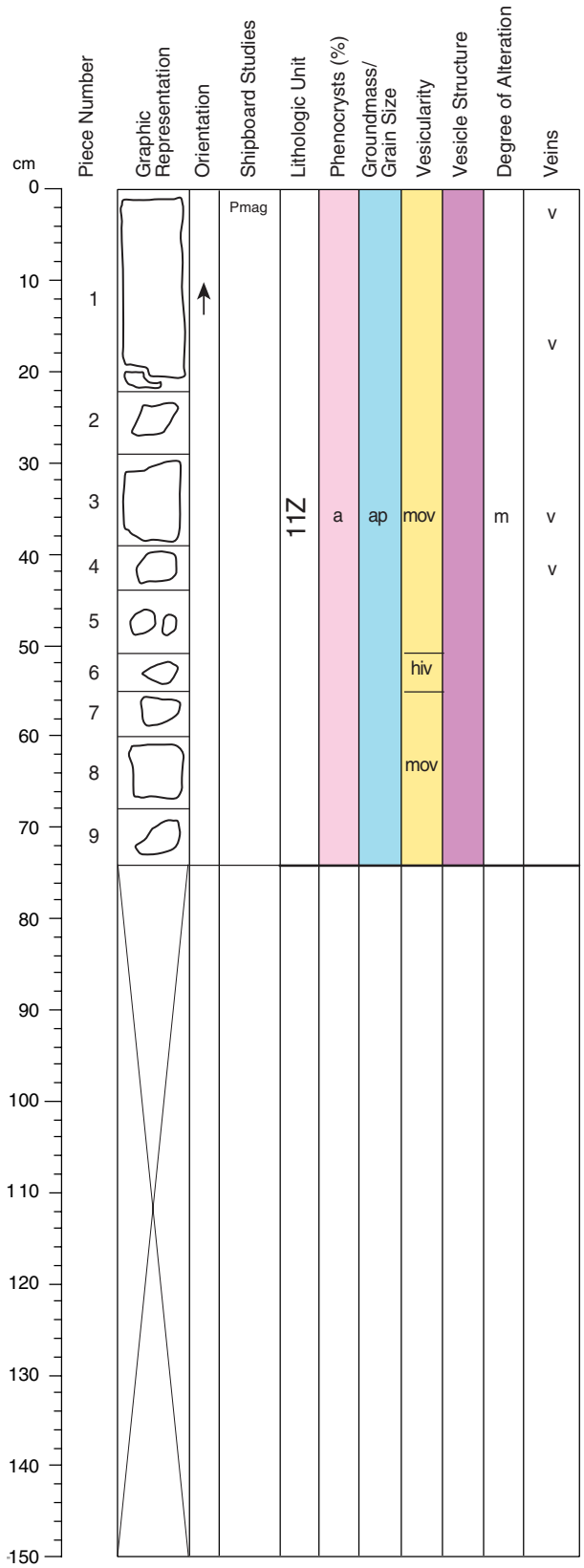
COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5) in color. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-30 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-29R-3 (Section top: 232.47 mbsf)

UNIT 11Z: APHYRIC TO SPARSELY OLIVINE- PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-9

CONTACTS: None observed. The boundary between the lobe forming Subunit 11Z and Subunit 11AA is inferred to be at the bottom of this section because Piece 9 has a 3 mm border of hyaloclastite.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	5	1	3	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
0-51 cm and 55-74 cm	10	0.5	Round
51-55 cm	30	1	Round

COLOR: Medium gray (N5).

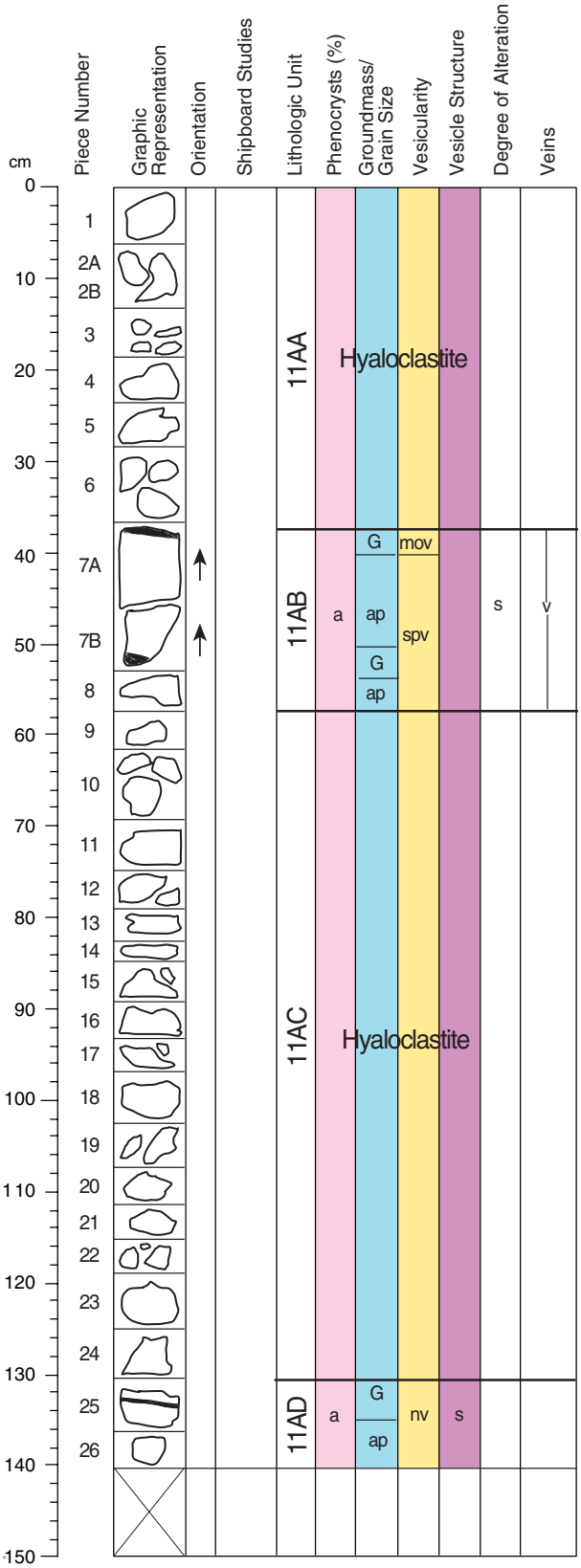
STRUCTURE: Lobed.

ALTERATION: Moderate. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark green clay.

VEINS/FRACTURES: Sparsely veined and fractured. Veins and filled fractures (<1-3 mm wide) are filled with white carbonate and dark green clay.

COMMENTS: Based on morphology, olivine (~1 mm) may occur at the 1% level, but it is difficult to identify since it has the same dark green color as the filled vesicles.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-30R-1 (Section top: 239.3 mbsf)

UNIT 11AA: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1–6

CONTACTS: None. The boundary between 11AA and the aphyric basalt of Subunit 11AB is between Pieces 6 and 7.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5) in color. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1–70 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 11AB: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 7-8

CONTACTS: None observed. The boundary between Subunit 11AB (basalt) and Subunit 11AC (hyaloclastite) is between Pieces 7 and 8.

PHENOCRYSTS:

	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1	0.5	0.75	Subhedral laths

GROUNDMASS: Aphanitic to glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:

%	Size (mm):		
	Mode	Average	Shape
	3-7	0.5	Round

COLOR: Medium gray (N5).

STRUCTURE: Lobed. Based on the presence of a glassy lobe margin in Pieces 7A and 7B.

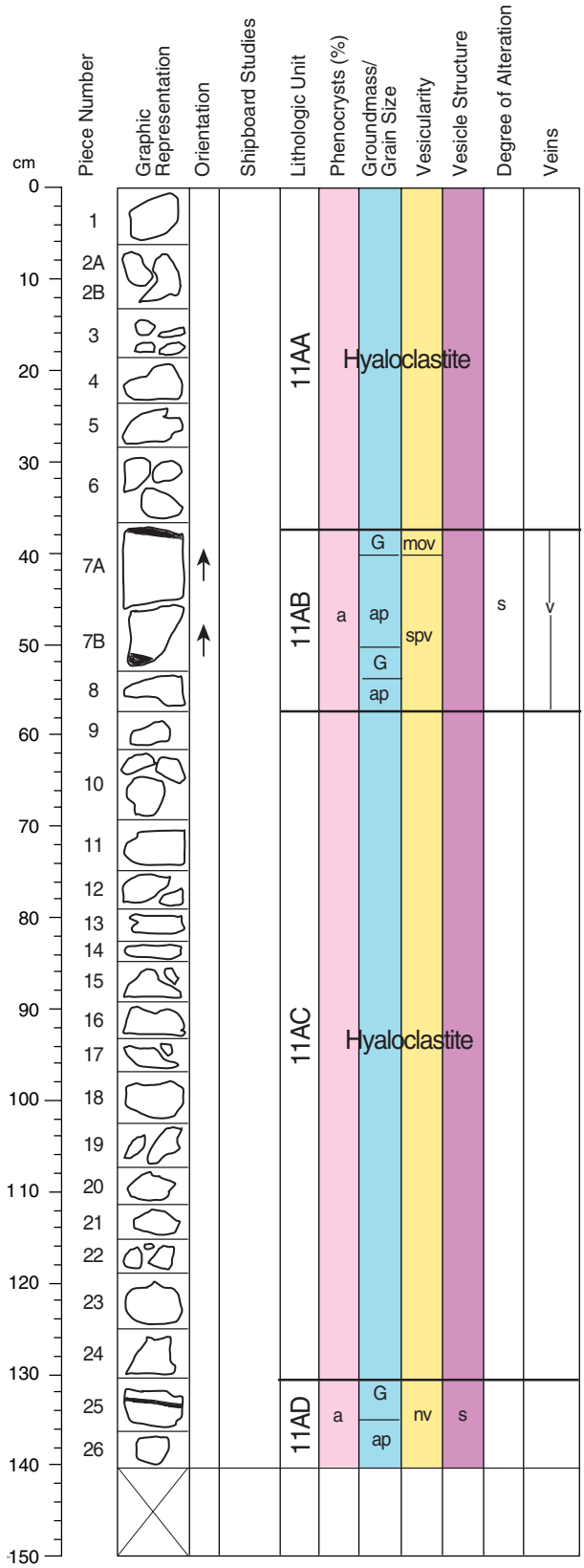
ALTERATION: Slightly altered. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark gray clay.

VEINS/FRACTURES: Sparsely veined and fractured. Veins and filled fractures (<0.5 mm wide) are present in Piece 7 and are filled with white carbonate and dark green clay.

COMMENTS: Subunit represents a complete lobe.

(Continued on next page)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-30R-1 (Section top: 239.3 mbsf)

UNIT 11AC: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 9–24

CONTACTS: None. The boundary between Subunit 11AC and the aphyric basalt of Subunit 11AD is between Pieces 24 and 25.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5) in color. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1–50 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 11AD: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 25-26

CONTACTS: None observed. The boundary between Subunit 11AC (hyaloclastite) and Subunit 11AD is between Pieces 24 and 25.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1	0.5	0.75	Subhedral laths

GROUNDMASS: Aphanitic to glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:

% Mode	Size (mm): Average	Shape
1	0.25	Round

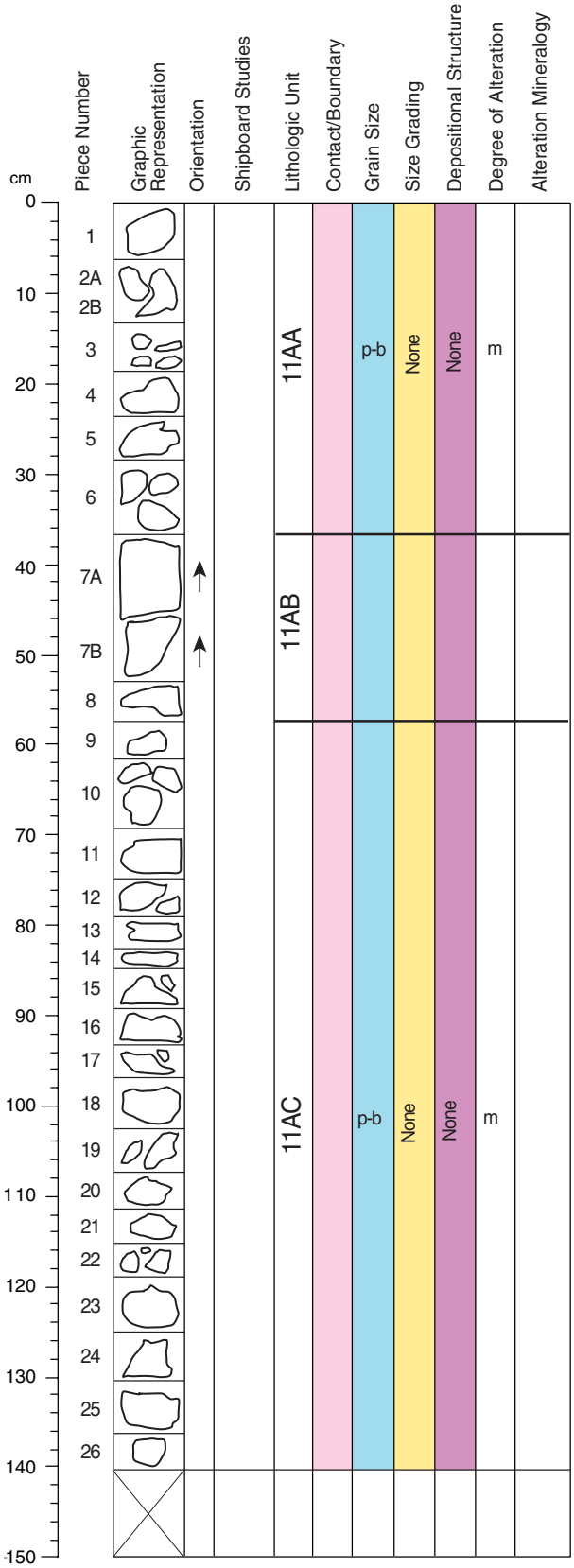
COLOR: Medium gray (N5).

STRUCTURE: Lobed. Based on the presence of a glassy lobe margin in Piece 25.

ALTERATION: Slightly altered. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark gray clay.

VEINS/FRACTURES: None present.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-30R-1 (Section top: 239.3 mbsf)

UNIT 11AA: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-6

CONTACTS: None. The boundary between 11AA and the aphyric basalt of Subunit 11AB is between Pieces 6 and 7.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5) in color. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-70 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 11AC: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 9-24

CONTACTS: None. The boundary between Subunit 11AC and the aphyric basalt of Subunit 11AD is between Pieces 24 and 25.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

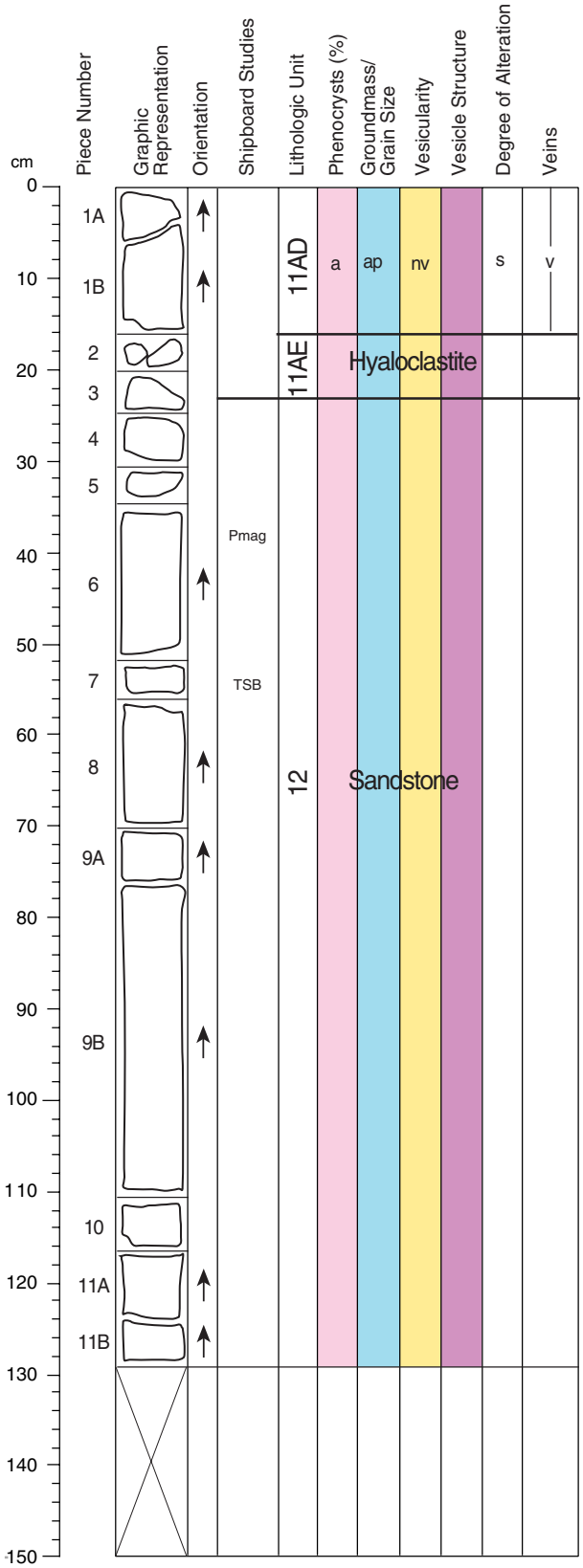
COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5) in color. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-50 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-30R-2 (Section top: 240.7 mbsf)

UNIT 11AD: APHYRIC TO SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None observed. The boundary between Subunit 11AD and Subunit 11AE (hyaloclastite) is between Pieces 1 and 2.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1.25	0.5	0.75	Subhedral laths

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides, and dark brownish gray mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
	<1	0.25	Round

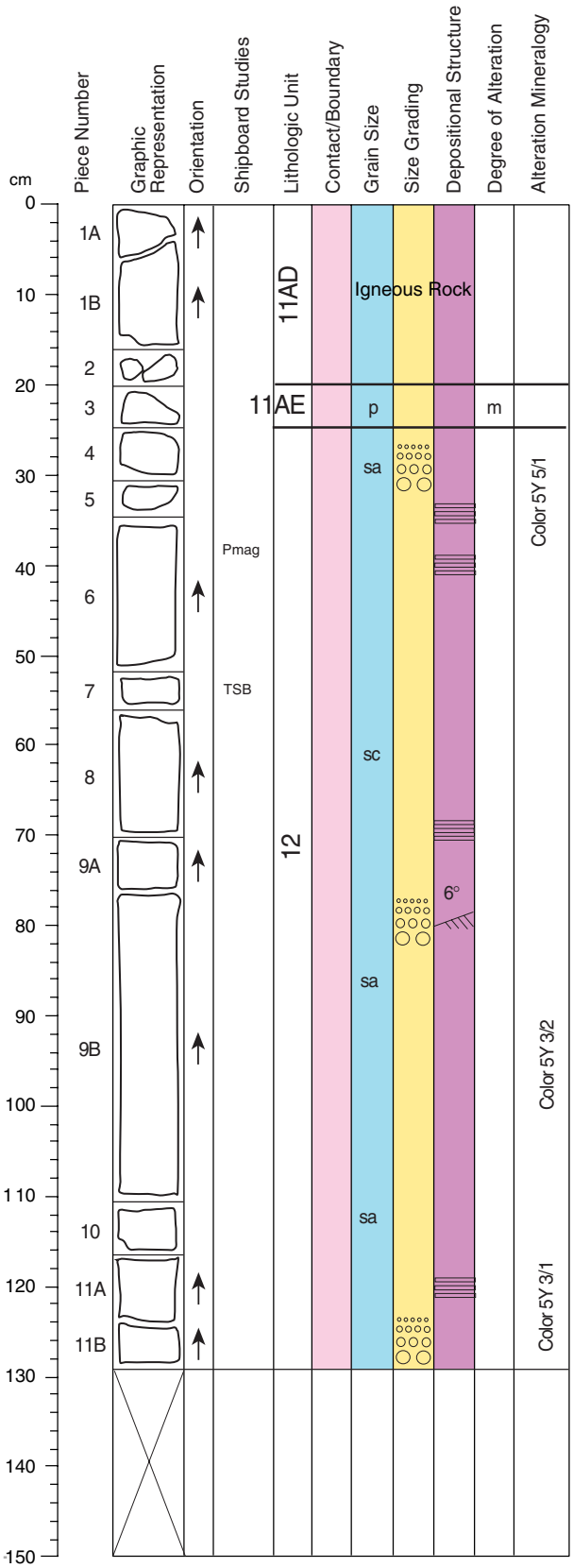
COLOR: Medium gray (N5).

STRUCTURE: Lobed. Based on the presence of a glassy lobe margin in upper part of Subunit 11AD in Section 30R-1.

ALTERATION: Slightly altered. Groundmass mesostasis is moderately altered to dark brownish gray clay. Vesicles are filled with dark gray clay.

VEINS/FRACTURES: Sparsely veined. Polygonally oriented veins are present throughout and are 2 mm wide and filled with white carbonate.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-30R-2 (Section top: 240.7 mbsf)

UNIT 11AE: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 2-3

CONTACTS: The contact between Subunit 11AE and the volcaniclastic sandstone of Unit 12 is in Piece 3 and is convoluted on a centimeter scale, indicative of soft sediment deformation (i.e., the top of Unit 12 was unlithified when Unit 11 was deposited).

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are pale yellowish brown (10 YR 6/2) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are generally unaltered and medium gray (N5). The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-40 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 12: VOLCANIC SANDSTONE.

Pieces: 4-11

CONTACTS: None observed. The upper boundary between Units 11 and 12 is between Pieces 3 and 4.

GENERAL DESCRIPTION: This core interval consists of, from top to bottom: plane-laminar lithic-vitric calcareous sandstone (Pieces 4 to 9A; 24-78 cm), structureless to irregular slumped calcareous sandy siltstone (Pieces 9B to 10A; 78-114 cm), graded sandstone with inclined lamination (Pieces 10A to 11B; 114-128 cm), dip 10°.

COLOR: Varied. The sandstone (Pieces 5 to 13) is gray (5 Y 5/1), to dark olive gray (5Y 3/2), to very dark gray (5Y3/1).

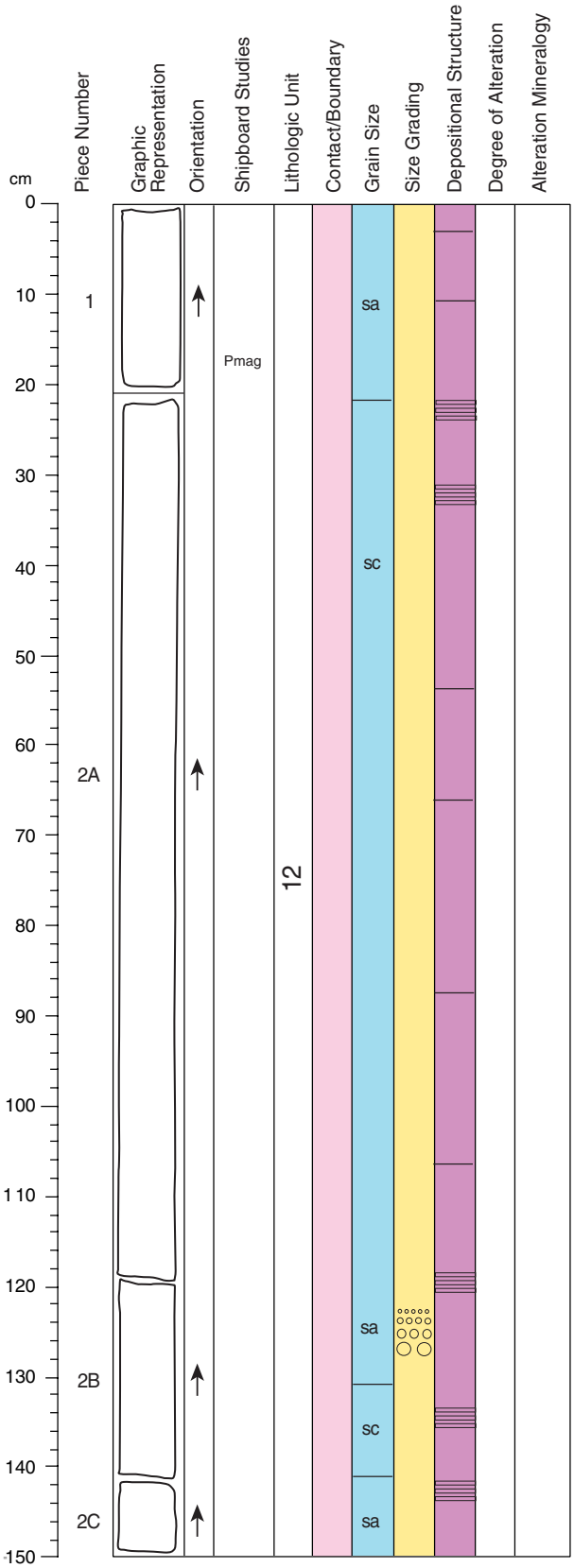
COMPONENTS: Foraminifers 10%-20%; Shell fragments 5%-10%; Calcite 20%-30%; Basalt lava clasts ~20%; basalt glass fragments 10%; Clay 2%-10%.

SEDIMENTARY TEXTURES:
24-78 cm: Fine to coarse siltstone with moderate to poor sorting.
68-100 cm: Fine to coarse sandy siltstone with inversely graded beds and very poor sorting.
100-106 cm: Medium sand with dispersed 2-25 mm fragments.

SEDIMENTARY STRUCTURES:
24-34 cm : weakly graded, poorly sorted.
34-56 cm : poorly sorted, slumped siltstone with areas of slumped more calcite-rich clasts.
56-70 cm : thin laminated siltstone.
70-78 cm : inclined (6°) lamination with alternating fine grained to coarse grained sandstone.
78-114 cm : slumped, poorly sorted sandy siltstone.
114-128 cm : weakly laminated, poorly sorted fine to coarse grained sandstone, with graded bedding at the end.

COMMENTS: Slumped intervals have brown areas of alteration. The presence of benthic foraminifers and shell fragments, disturbed bedding and high abundance of angular basalt glass fragments are indicative of deposition in an energy environment where the sediment supply is high.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-30R-3 (Section top: 242.0 mbsf)

UNIT 12: VOLCANIC SANDSTONE.

Pieces: 1-2

CONTACTS: None

GENERAL DESCRIPTION: This core interval consists of, from top to bottom: poorly sorted, structureless sandstone (Piece 1; 0-20 cm), structureless to irregular slumped calcareous sandstone (Pieces 2A; 20-72 cm), two cycles of indistinctly graded sandstone with occasional slumping and poor sorting (Pieces 2a-2c; 72-150 cm).

COLOR: Greenish gray (5/10G) to dark greenish gray (3/5BG) with clasts in other colors.

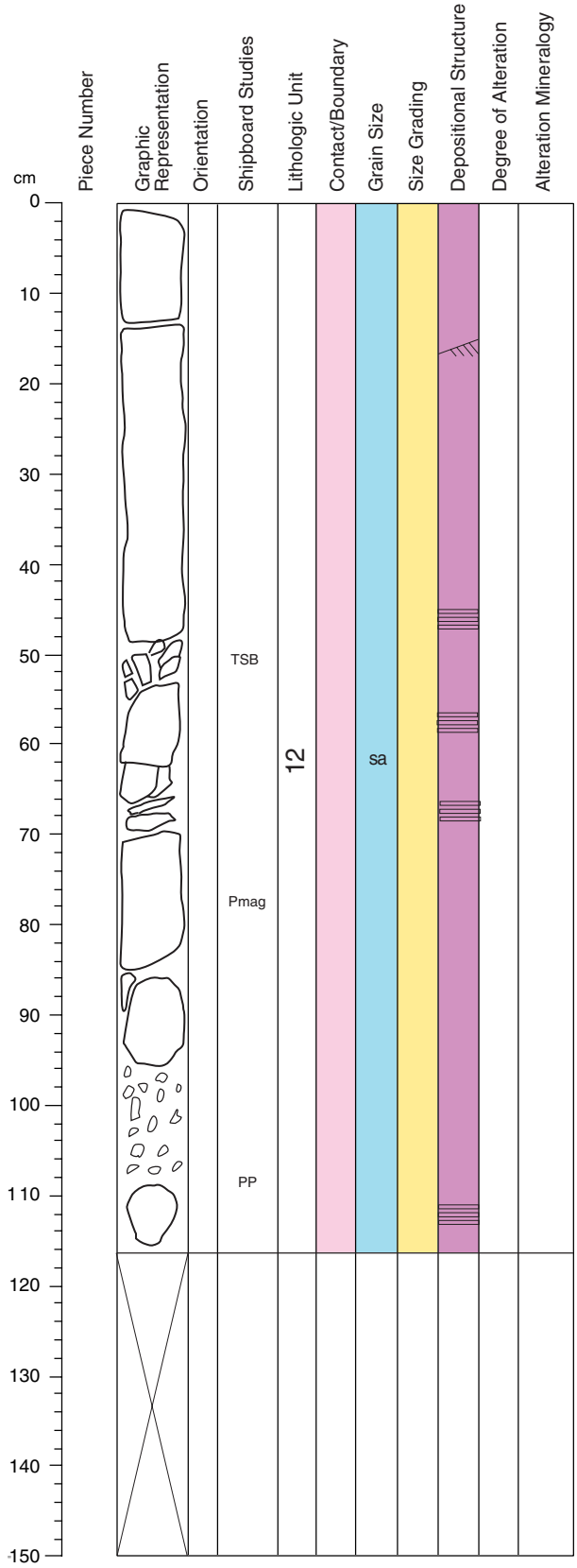
COMPONENTS: Foraminifers 10%-20%; Shell fragments 2%-10%; Calcite 5%-20%; Basalt clasts ~50%; Volcanic ash fragments 10%; Clay 1%-5%; pyrite 2%.

SEDIMENTARY TEXTURES:
0-20 cm: Fine to coarse sandstone with poor sorting.
20-72 cm: Very fine to coarse poorly sorted sandstone.
72-150 cm: Medium grained siltstone to coarse grained sandstone.

SEDIMENTARY STRUCTURES:
0-20 cm: Poorly graded, poorly sorted.
20-72 cm: Poorly sorted, slumped silty sandstone with areas of slumped more calcite-rich clasts, and large shell fragments and basalt fragments (2-10 mm).
72-150 cm: Thin cycles of structureless beds of fine grained silty sandstone and coarse grained sandstone.

COMMENTS: The presence of benthic foraminifers and shell fragments, disturbed bedding and high abundance of angular basalt glass fragments are indicative of deposition in an energy environment where the sediment supply is high.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-30R-4 (Section top: 243.5 mbsf)

UNIT 12: VOLCANIC SANDSTONE

Pieces: 1

CONTACTS: At 2 cm a contact is present between very dark calcite poor coarse sandstone and calcareous cross bedded sandstone.

GENERAL DESCRIPTION: This core interval consists of, from top to bottom: moderately sorted, cross bedded sandstone (Piece 1; 2-9 cm), structureless to irregular slumped calcareous sandstone (Piece1; 9-34 cm), moderately sorted, weakly graded sandstone with occasional slumping (Piece 1; 72-150 cm).

COLOR: Bluish black (2.5/5 PB) and light gray (5YR 7/1) with clasts in other colors.

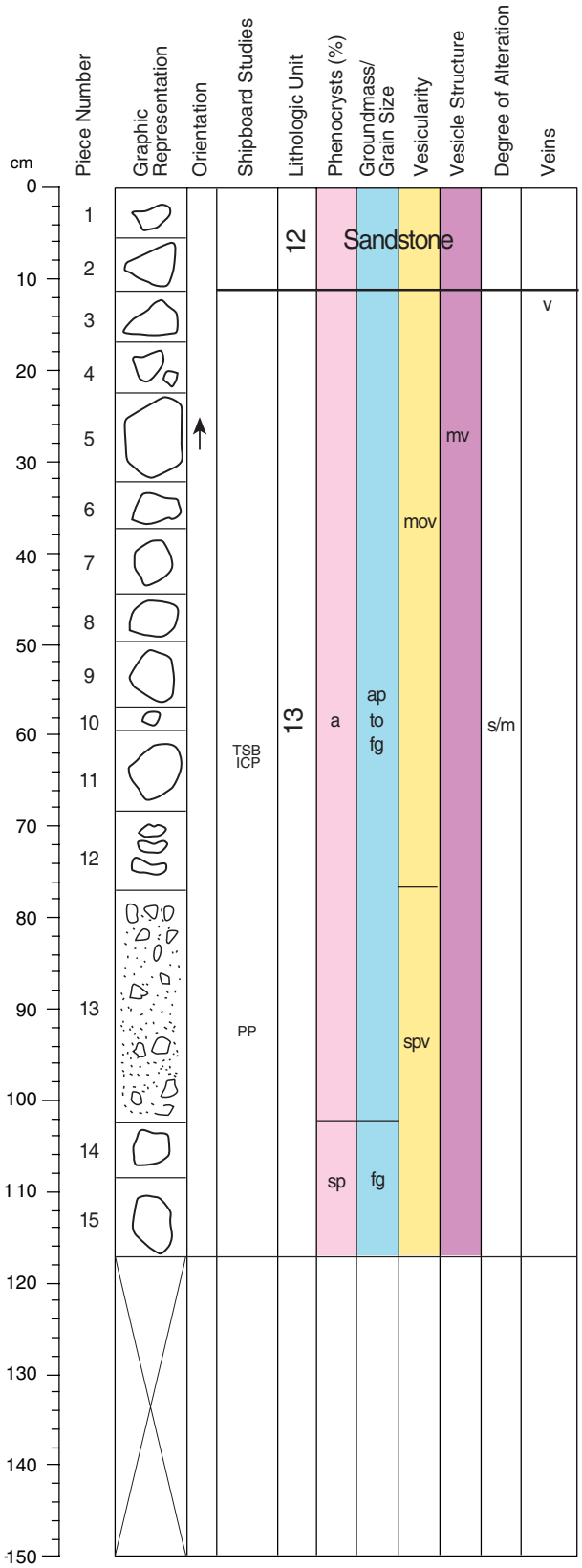
COMPONENTS: Foraminifers 2%-5%; Shell fragments 10%; Calcite 5%-20%; Basalt clasts ~30%; Volcanic ash fragments 30%; Clay ~30%.

SEDIMENTARY TEXTURES:
2-9 cm: Fine to coarse sandstone with moderate sorting.
9-150 cm: Fine to very coarse sandstone.

SEDIMENTARY STRUCTURES:
2-9 cm: Crossbedded sandstone.
9-34 cm: Weakly laminated, disturbed silty sandstone.
34-95 cm: Very coarse to fine weakly inclined laminated moderately sorted sandstone.
95-109 cm:Very disturbed loose mixture of sandstone components.
109-116 cm: Coarse grained 'floating' (Sand grains not in contact with each other, surrounded by calcite cement) sandstone with high content of calcite cement.

COMMENTS: This is an high energy environment with high sedimentation rate and reworking of sediment components within a limited area.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-31R-1 (Section top: 248.9 mbsf)

UNIT 13: APHYRIC TO SPARSELY OLIVINE-PHYRIC TO PLAGIOCLASE-PHYRIC BASALT.

Pieces: 3-15

CONTACTS: The boundary between Unit 12 (sandstone) and Unit 13 (aphyric to sparsely olivine-phyric basalt) is inferred to be between Pieces 2 and 3 at 11 cm.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine:	<1-2	1	0.5	0.5	Subhedral; equant

GROUNDMASS: Aphanitic to fine grained. The groundmass contains plagioclase, clinopyroxene, black oxides, and olivine(?).

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
11-77 cm	7	2	Round to irregular
77-117 cm	1-2	0.5	Round

COLOR: Medium gray (N5).

STRUCTURE: Vesicular.

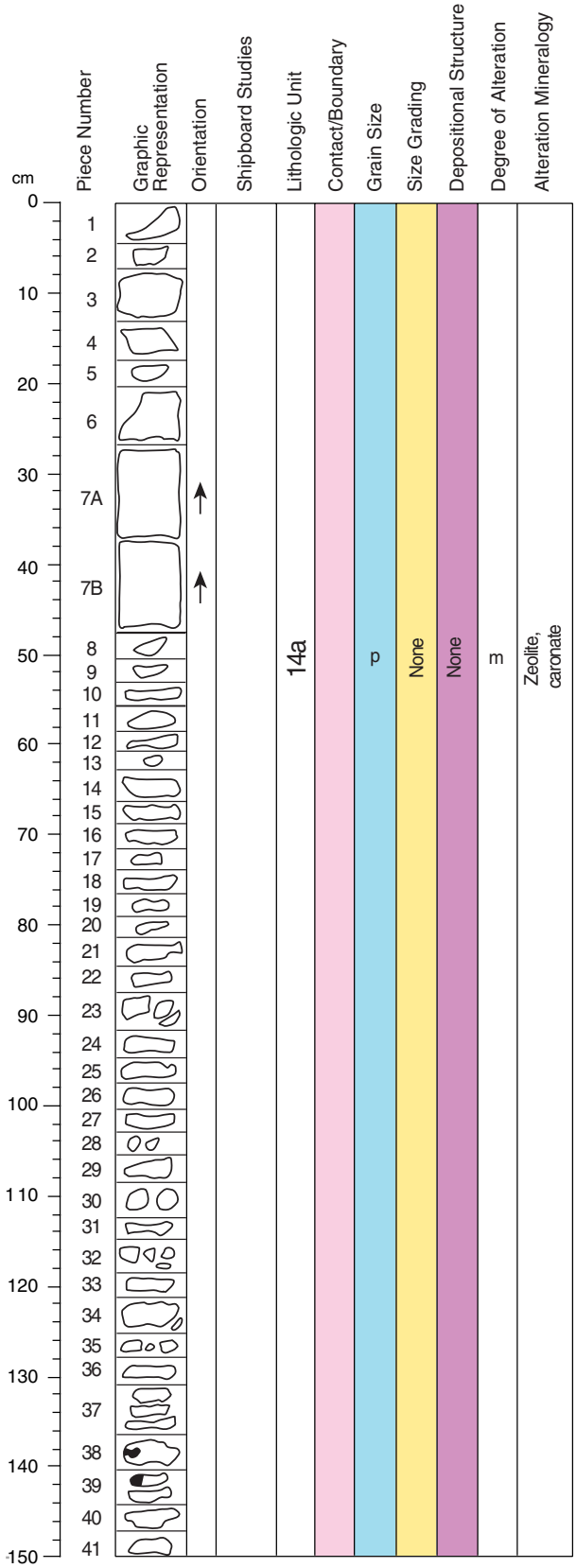
ALTERATION: Slight to moderate. Vesicles are filled with carbonate, zeolite, pyrite, Fe oxyhydroxide and segregated material, or are unfilled. Olivine phenocrysts and groundmass olivine, if any, are unaltered.

VEINS/FRACTURES: Sparsely veined. 1-7 mm wide, random oriented veins are present in Piece 3, and are filled with carbonate.

COMMENTS: A 15-mm-wide megavesicle is present in Piece 5, and is filled with segregated material. Several pieces in Pieces 12 and 13 contain detrital carbonate. Because of the poor recovery of this core, they are inferred to be connected with the limestone present in Unit 12.

*1 Phenocrysts are not evenly distributed in the section. From 11 cm to 102 cm, the phenocryst abundance is <1%; and from 102 cm to 117 cm, the phenocryst abundance is 2%. Olivine is the only phenocryst phase, and most olivine phenocrysts are of the same size as the groundmass phase, which makes it difficult to tell whether groundmass olivine is present or not.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-32R-1 (Section top: 258.5 mbsf)

UNIT 14a: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-41

CONTACTS: The contact between Units 13 and 14 is inferred to be at the beginning of this section.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are yellowish brown (2.5 YR 8/4) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are sometimes unaltered and medium gray (N5). The matrix is dark green.

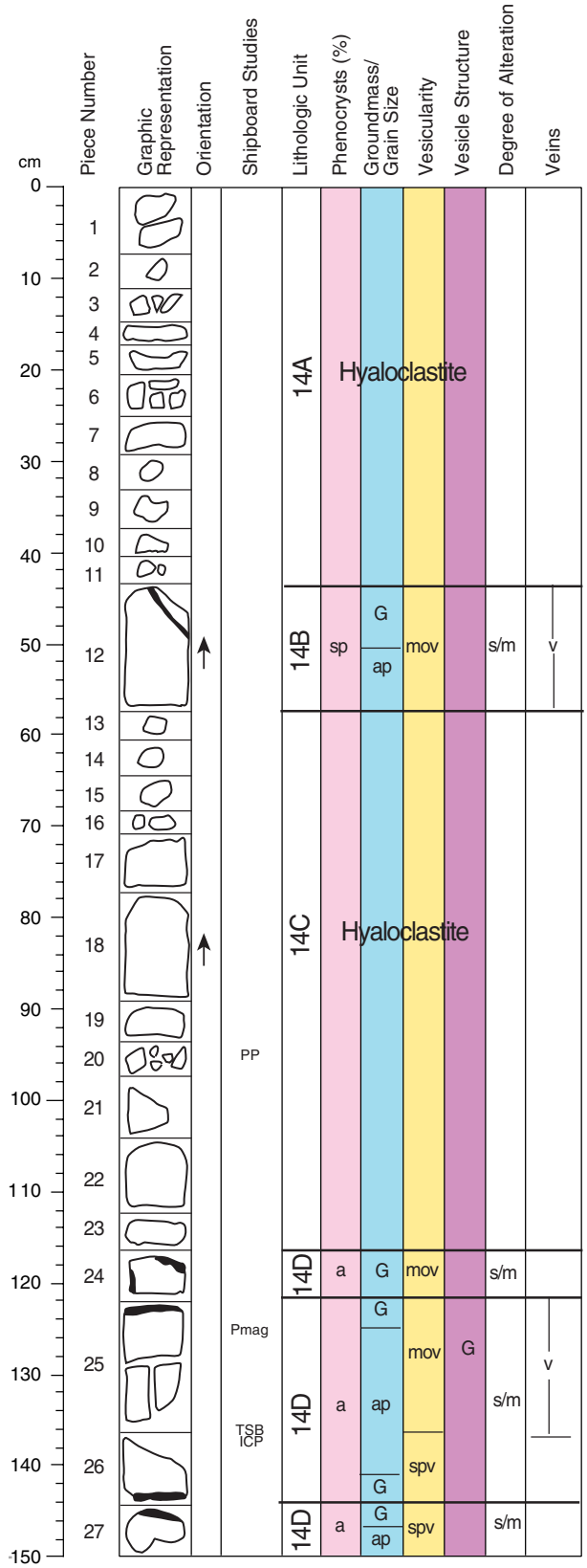
COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay and zeolite. Clasts are 1-30 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

COMMENTS: Piece 9 contains an elongate rip-up clast of fine-grained siltstone.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-32R-2 (Section top: 260.0 mbsf)

UNIT 14b: SPARSELY OLIVINE-PHYRIC BASALT.

Pieces: 12

CONTACTS: The boundary between Subunit 14a (hyaloclastite basalt lapilli breccia) and Subunit 14b (sparsely olivine-phyric basalt) is inferred to be between Pieces 11 and 12 at 43 cm.

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

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and olivine(?).

VESICLES:	%	Size (mm)	
	Mode	Avg.	Shape
Moderately vesicular	20	1	Round to irregular

COLOR: Dark gray (N4).

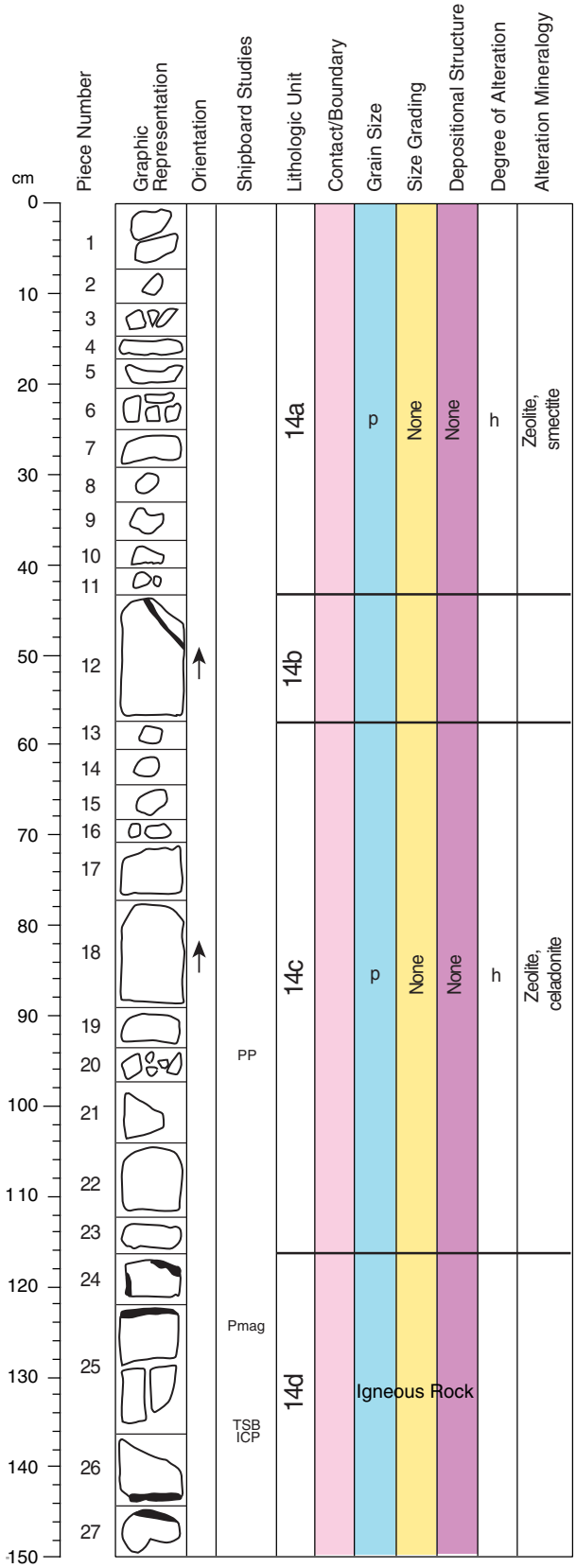
STRUCTURE: Lobed. Lobe margin is present in Piece 12 at 43 cm, based on the presence of unaltered glass.

ALTERATION: Slight to moderate. Olivine phenocrysts and groundmass olivine, if any, are unaltered. Vesicles are filled with pale green and blue clay, carbonate and zeolite.

VEINS/FRACTURES: Sparsely veined. <1 mm wide, randomly oriented veins are present in Piece 12, and are filled with pale green clay.

COMMENTS: Most olivine phenocrysts are similar in size as the main groundmass phases size, which makes it difficult to tell whether groundmass olivine is present or not.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-32R-2 (Section top: 260.0 mbsf)

UNIT 14a: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-11

CONTACTS: None.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are greenish black (5G 2/1) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are sometimes unaltered and medium gray (N5). Vesicles are often filled with coarse yellowish gray (5Y 8/1) material. The matrix is dark green.

COMPONENTS: Angular clasts of highly vesicular basalt and altered basaltic glass, with a cement of dark green clay, expanding gray clay (smectite?) and zeolite. Clasts are 0.5-20 mm in size.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 14B: SPARSELY OLIVINE-PHYRIC BASALT.

Pieces: 12

CONTACTS: The boundary between Subunit 14A (hyaloclastite basalt lapilli breccia) and Subunit 14B (sparsely olivine-phyric basalt) is inferred to be between Pieces 11 and 12 at 43 cm.

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

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and olivine(?).

VESICLES: %
Mode Avg. Size (mm) Shape
Moderately vesicular 20 1 Round to irregular

COLOR: Dark gray (N4).

STRUCTURE: Lobed. Lobe margin is present in Piece 12 at 43 cm, based on the presence of unaltered glass.

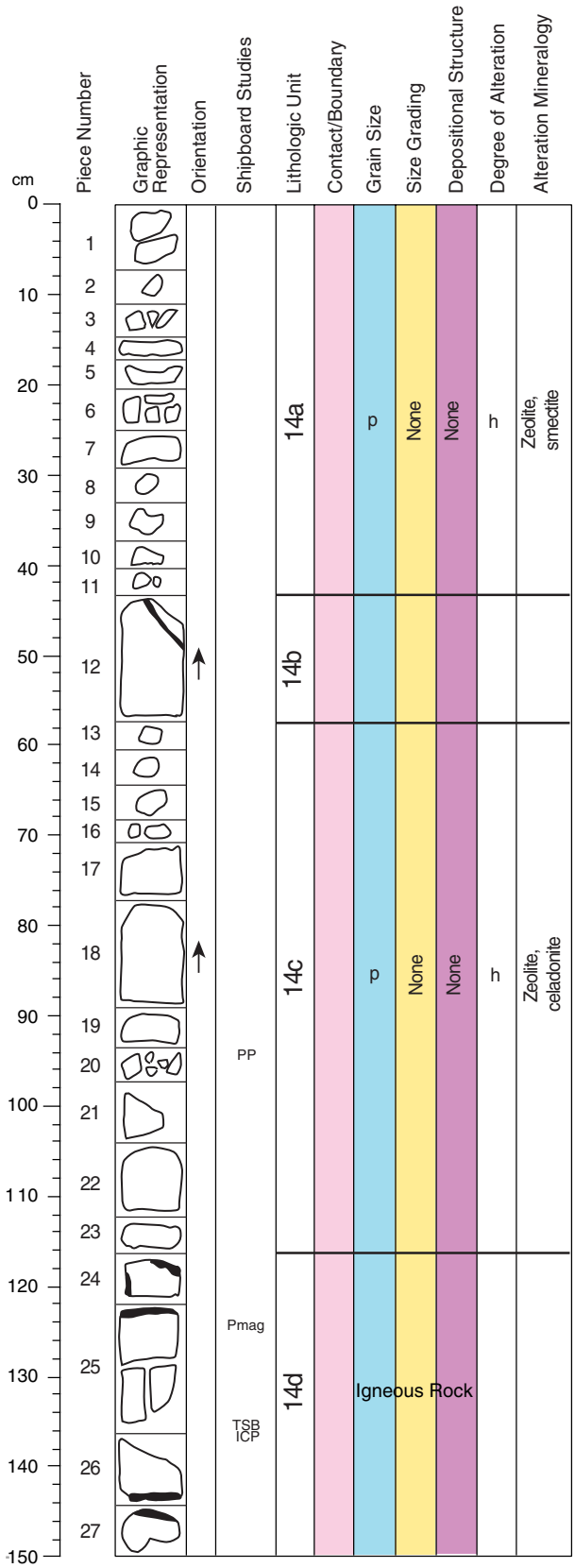
ALTERATION: Slight to moderate. Olivine phenocrysts and groundmass olivine, if any, are unaltered. Vesicles are filled with pale green and blue clay, carbonate and zeolite.

VEINS/FRACTURES: Sparsely veined. <1 mm wide, randomly oriented veins are present in Piece 12, and are filled with pale green clay.

COMMENTS: Most olivine phenocrysts are similar in size as the main groundmass phases size, which makes it difficult to tell whether groundmass olivine is present or not.

(Continued on next page)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-32R-2 (Continued)

UNIT 14c: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 13-23

CONTACTS: None. The boundary between 14B (basalt) and 14C (breccia) is between Pieces 12 and 13.

GENERAL DESCRIPTION: Moderately altered, clast supported hyaloclastite basalt lapilli breccia.

COLOR: Clasts are greenish black (5G 2/1) or have dusky yellowish green (5GY 5/2) rims and moderate yellow green (5GY 7/4) interiors. Larger clasts are sometimes unaltered and medium gray (N5). Vesicles are often filled with coarse yellowish gray (5Y 8/1) material. The matrix is dark green.

COMPONENTS: Angular clasts of altered basaltic glass and some up to 20 mm clasts of vesicular basalt. Cement consists of dark green clay, expanding gray clay (smectite?) and zeolite. Clasts are 1-20 mm in size. Vesicles compose up to 20% of rock and contain bluish green celadonite.

SEDIMENTARY TEXTURES: Unsorted, clast supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 14d: APHYRIC BASALT.

Pieces: 24-27

CONTACTS: The boundary between Subunit 14C (hyaloclastite basalt lapilli breccia) and Subunit 14D (aphyric basalt) is inferred to be between Pieces 23 and 24 at 116 cm.

PHENOCRYSTS: % Grain Size (mm)
Mode Max. Min. Avg. Shape/Habit
Plagioclase: <1 1 0.5 1 Subhedral laths
Olivine: <1 1 0.5 1 Subhedral
Clinopyroxene: <<1 1 0.5 1 Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and olivine(?).

VESICLES: %
Mode Avg. Size (mm) Shape
116-136 cm 20 1 Round to irregular
136-150 cm 5 0.5 Round

COLOR: Brownish gray (5YR 4/1).

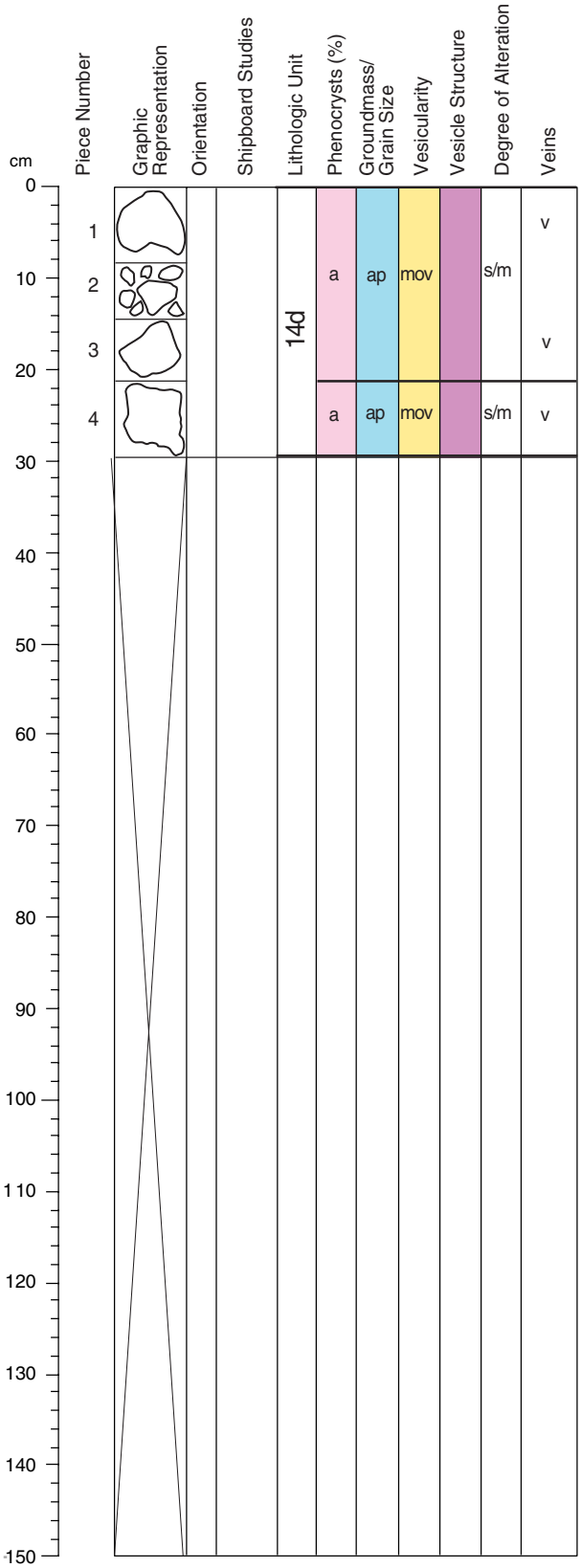
STRUCTURE: Lobed. Lobe margins are present in Piece 24 at 116 cm, between Pieces 24 and 25 at 122 cm, and between Pieces 26 and 27 at 144 cm, based on the presence of unaltered glass.

ALTERATION: Slight to moderate. Olivine phenocrysts and groundmass olivine, if any, are unaltered. Vesicles are filled with pale green and blue clay, carbonate and zeolite.

VEINS/FRACTURES: Sparsely veined. ~1 mm wide, randomly oriented veins are present in Piece 25, and are filled with pale green clay.

COMMENTS: Most olivine phenocrysts are similar in size to the main groundmass phases size, which makes it difficult to tell whether groundmass olivine is present or not. Most plagioclase and clinopyroxene phenocrysts are intergrown with olivine.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-32R-3 (Section top: 261.5 mbsf)

UNIT 14d: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1	0.5	1	Subhedral laths
Olivine:	<1	1	0.5	1	Subhedral
Clinopyroxene:	<<1	1	0.5	1	Subhedral

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, black oxides, and olivine(?).

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	20	0.5	Round to irregular

COLOR: Brownish gray (5YR 4/1).

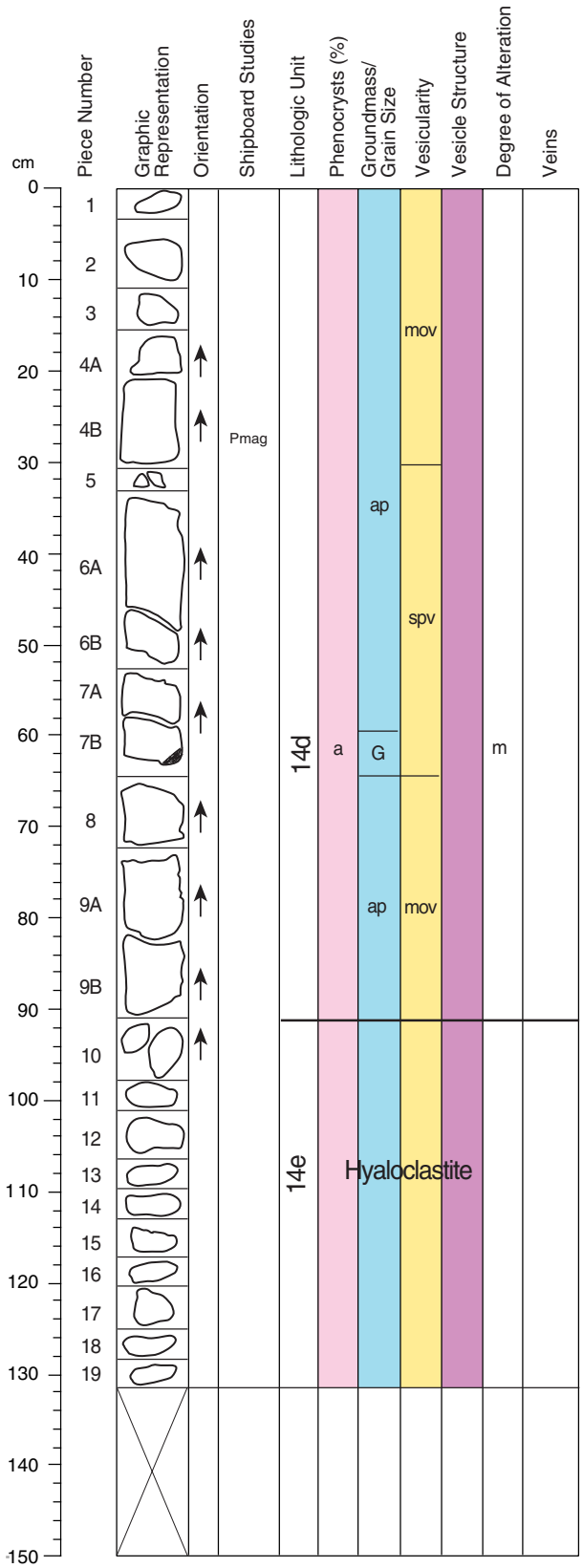
STRUCTURE: Lobed. Lobe margins are present in Piece 1 at 0 cm, between Pieces 3 and 4 at 20 cm and in Piece 4 at 30 cm, based on the presence of unaltered glass.

ALTERATION: Slight to moderate. Olivine phenocrysts and groundmass olivine, if any, are unaltered. Vesicles are filled with pale green and blue clay, carbonate and zeolite.

VEINS/FRACTURES: Moderately veined. ~1 mm wide cube jointed veins are present in Pieces 1, 3, and 4, and are filled with pale green clay and carbonate.

COMMENTS: Most olivine phenocrysts are similar in size as the main groundmass phases size, which makes it difficult to tell whether groundmass olivine is present or not. Most plagioclase and clinopyroxene phenocrysts are intergrown with olivine.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-33R-1 (Section top: 268.1 mbsf)

UNIT 14d: APHYRIC TO SPARSELY OLIVINE-PHYRIC BASALT.
Pieces: 1-9

CONTACTS: The boundary between Subunit 14D (aphyric basalt) and Subunit 14E (hyaloclastite basalt lapilli breccia) is inferred to be at 91 cm, between Pieces 9B and 10.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<1	1.5	0.5	1	Euhedral; prismatic
Olivine:	1	1	0.5	0.7	Subhedral; equant

GROUNDMASS: Aphanitic. Glassy near lobe margins. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
0-30 cm	15	2	Round
30-64 cm	3	1	Round
64-91 cm	15	2	Round

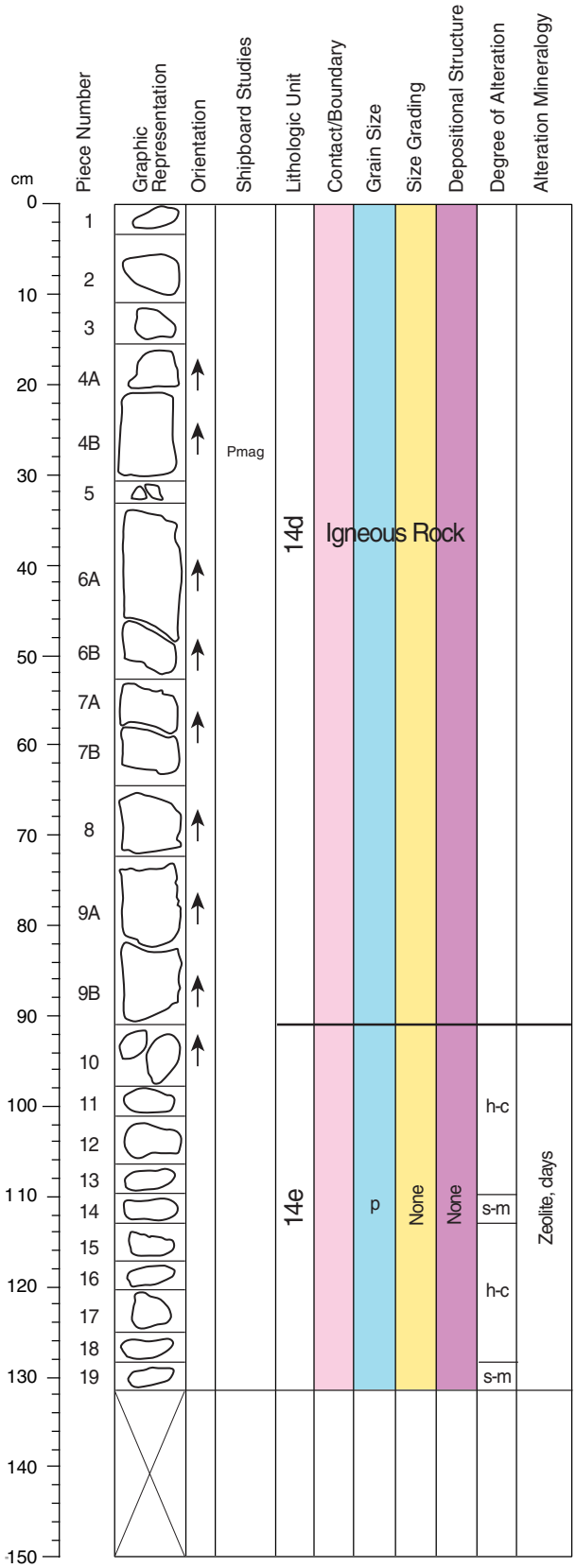
COLOR: Medium dark gray (N4).

STRUCTURE: Lobed. Glassy lobe margin is present in Piece 7B.

ALTERATION: Moderate. Olivine microphenocrysts are partially altered to Fe-oxyhydroxide and carbonate, but many are unaltered. Glass on Piece 7B is partially devitrified to green clay.

VEINS/FRACTURES: Sparsely fractured. Randomly oriented, 0.5-1.0 mm fractures in Pieces 2 and 6 are filled with carbonate, or lined with green clay.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-33R-1 (Section top: 268.1 mbsf)

UNIT 14e: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 10-19

CONTACTS: None observed. The boundary between Subunits 14D (basalt) and 14E is at 91 cm between Pieces 9 and 10.

GENERAL DESCRIPTION: Clast and matrix supported basaltic lapilli breccia.

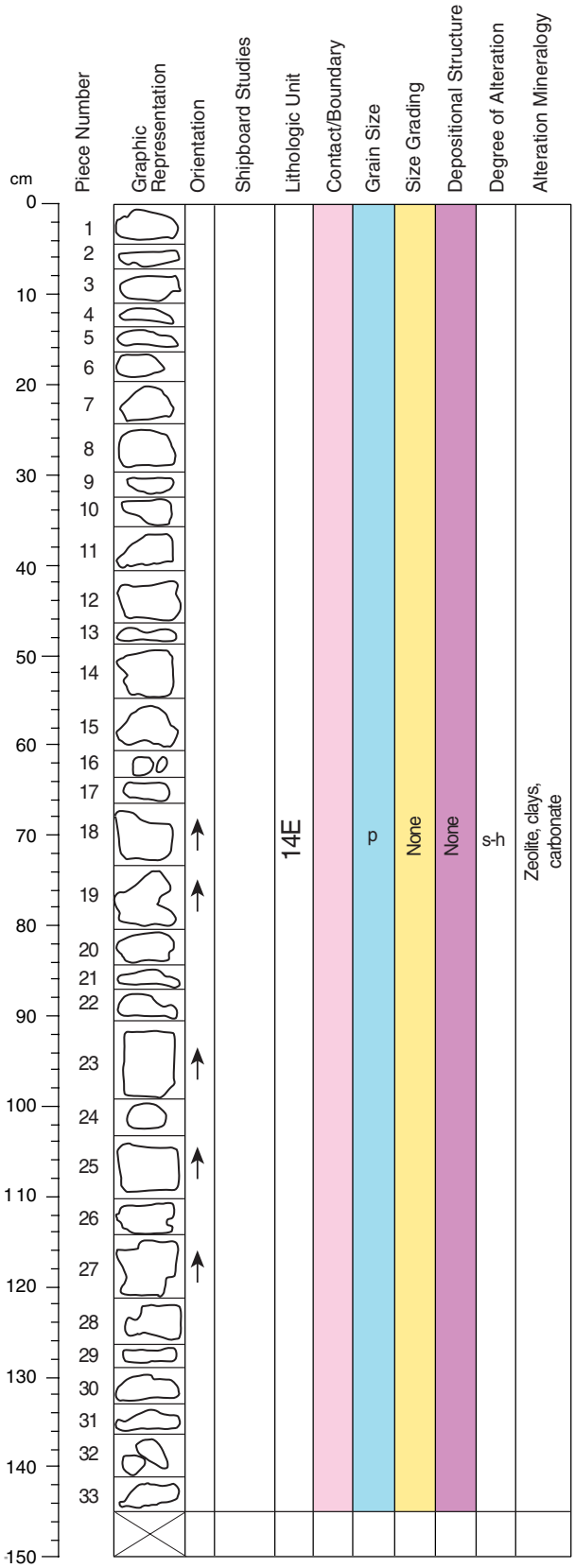
COLOR: Light brownish gray (5YR 6/1), greenish black (5GY 2/1), dusky green (5G 3/2).

COMPONENTS: Angular to subround clasts of altered basaltic glass (generally ≤1 cm) and clasts of highly vesicular basalt (>5 cm). Vesicles are round to irregular and generally ~1 mm and filled with dark green clay. The basalt and glass are aphyric. Basalt groundmass is aphanitic and highly altered. Glass is generally completely altered, except in Pieces 13 and 19 where unaltered glass is present. Zeolite and green clay form the cement.

SEDIMENTARY TEXTURES: Unsorted. Gravel-size clasts. Clast to matrix supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-1 (Section top: 269.9 mbsf)

UNIT 14E: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: 1-33

CONTACTS: None.

GENERAL DESCRIPTION: Clast and matrix supported basaltic lapilli breccia.

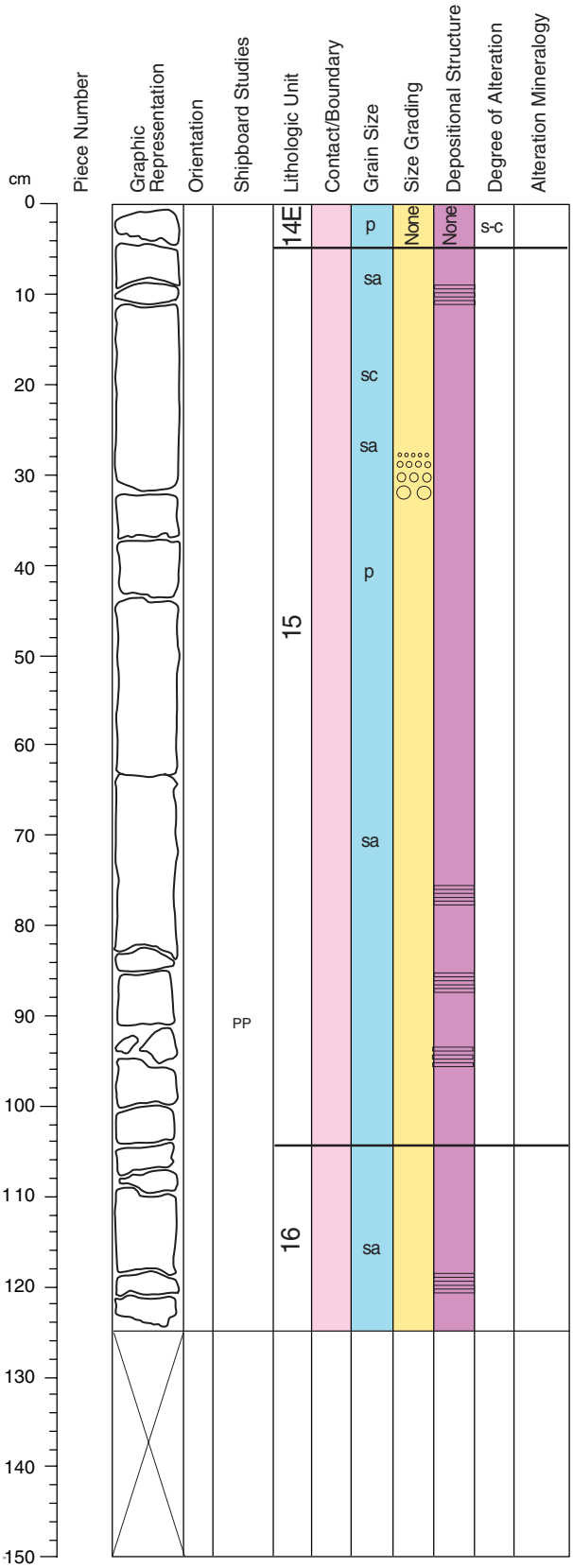
COLOR: Light brownish gray (5YR 6/1), greenish black (5GY 2/1), dusky green (5G 3/2).

COMPONENTS: Angular to subround clasts of altered basaltic glass (generally ≤1 cm) and clasts of highly vesicular basalt (>7 cm). Vesicles are round to irregular and generally ~0.5 mm and filled with dark green clay. The basalt and glass are aphyric. Basalt groundmass is aphanitic and highly altered. Glass is generally completely altered, although unaltered relicts are present throughout the section in the breccia and as discontinuous glassy lobe margins on the larger basalt clasts (e.g., Piece 25).

SEDIMENTARY TEXTURES: Unsorted. Gravel-size clasts in a sand- to silt-size matrix. Clast to matrix supported.

SEDIMENTARY STRUCTURES: None, massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-2 (Section top: 271.35 mbsf)

UNIT 14E: HYALOCLASTITE BASALT LAPILLI BRECCIA.

Pieces: None. Cut as sediment core. Interval 0-4 cm.

CONTACTS: The contact between Unit 14E and Unit 15 (limestone) is at 4 cm.

GENERAL DESCRIPTION: Clast to matrix supported basaltic lapilli breccia.

COLOR: Light brownish gray (5YR 6/1), greenish black (5GY 2/1), dusky green (5G 3/2).

COMPONENTS: Angular to subround clasts of altered basaltic glass and clasts of highly vesicular basalt (generally ≤1.5 cm). Vesicles are round to irregular and generally ~0.5 mm and filled with dark green clay. The basalt and glass are aphyric. Glass is generally completely altered.

SEDIMENTARY TEXTURES: Unsorted. Gravel-size clasts in a sand- to silt-size matrix. Clast to matrix supported.

SEDIMENTARY STRUCTURES: None, massive.

UNIT 15: CALCAREOUS GRAINSTONE, VOLCANICLASTIC GRAINSTONE, AND CONGLOMERATE.

Pieces: N/A. Cut as sediment core.

CONTACTS: Interval 4-140 cm.

GENERAL DESCRIPTION: This section contains beds of gravel-supported conglomerate (i.e., microconglomerate) which are followed upward by cm-sized light gray, inclined laminations that grade into massive calcareous grainstone. These lithofacies can be also interbedded with clast-supported volcaniclastic sandstone (i.e., volcaniclastic grainstone). Contacts are sharp to gradational.

COLOR: Light green (5GY 4/1) and dark gray (N5).

COMPONENTS: Angular to sub-rounded sub-mm to mm-sized clasts of altered basaltic glass, highly vesicular basalt (generally ≤1.5 cm) characterize this volcaniclastic grainstone. Lighter greenish beds consist of calcareous grainstone with variable grain composition. Grains are calcareous microfossils such as Miliolid foraminifers, and Nummulites including unidentified sub-mm minor components from larger bioclasts (>25% to >80%), green clay (<5 to 7%) and crystalline basalt (5%).

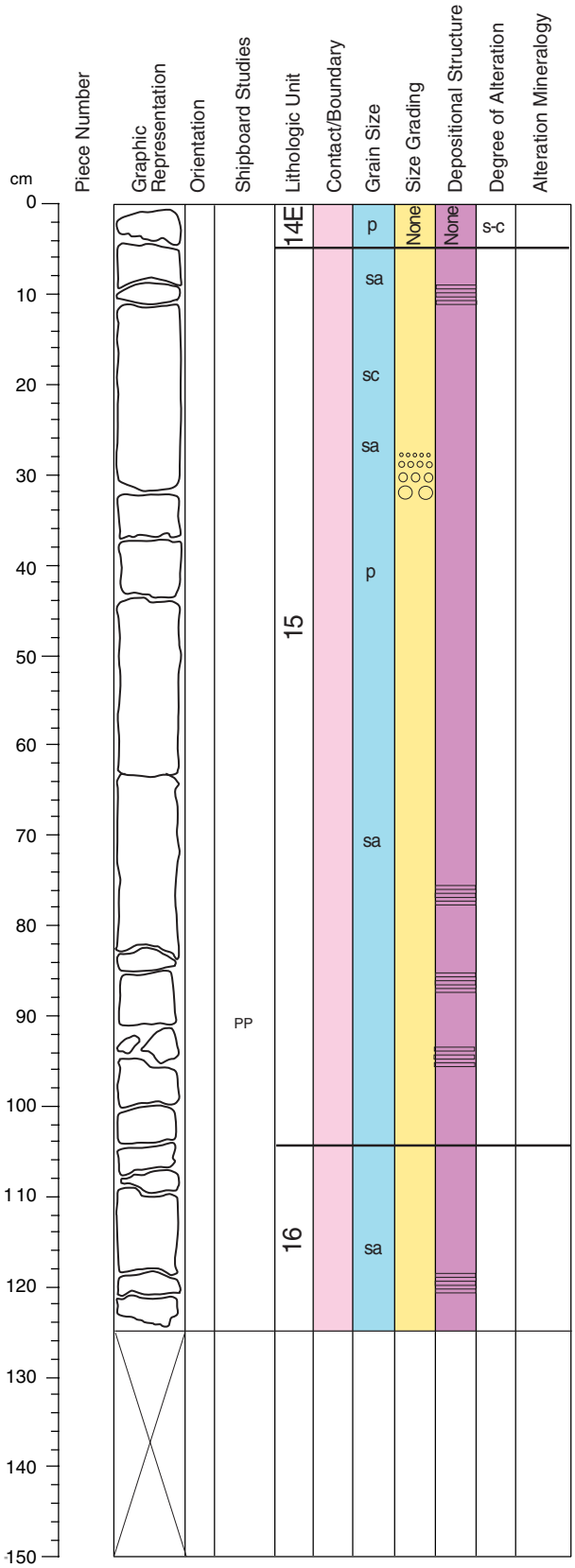
SEDIMENTARY TEXTURES: Coarse-grained elements (0.5-1.5 mm) occur at 0-24 cm. Finer elements (<0.5 mm) dominate beds at 24-75 cm, while rounded to angular gravel-sized clasts occur mainly at 95-104 cm.

SEDIMENTARY STRUCTURES: Planar laminations mainly occur at finer intervals. Unsorted to fine laminations at 82-89 cm. Microconglomerate can be structureless, poorly sorted to faintly layered, and/or directly size-graded.

COMMENTS: The presence of interbedded calcareous and volcaniclastic supported grainstones suggests alternating periods of shallow water to subaerial deposition, and variable volcanic inputs in a neritic setting.

(Continued on next page.)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-2 (Continued)

UNIT 16: LITHIC-VITRIC SANDSTONE

Pieces: N/A. Cut as sediment core.

CONTACTS: at 104 cm

GENERAL DESCRIPTION: This section contains clast-supported volcaniclastic grainstone.
Contacts are sharp to gradational.

COLOR: Dark gray (N5).

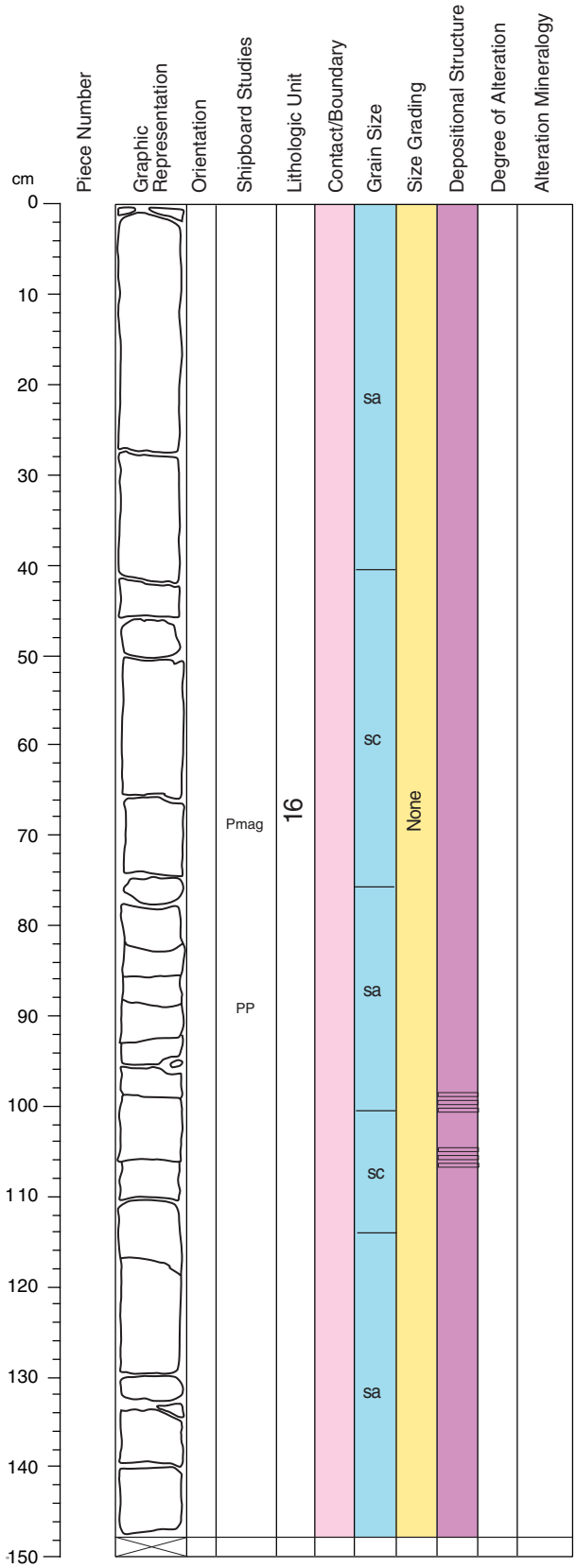
COMPONENTS: Angular to sub-angular clasts of basaltic glass altered to green clay, vesicular basalt, carbonate, green clay and zeolite.

SEDIMENTARY TEXTURES: Coarse elements (0.5-1.5 mm) at 0-24 cm). Finer elements (<0.5 mm) at 24-75 cm and rounded to angular pebble-sized clasts at 95-104 cm.

SEDIMENTARY STRUCTURES: Horizontal beds faintly stratified to massive. Presence of vertical burrowing at 10-24 cm.

COMMENTS: This bed is barren of microfossils.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-3 (Section top: 272.61 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE

Pieces: N/A. Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of alternating beds of fine to coarse-grained clast-supported volcaniclastic grainstone with gradational contacts.

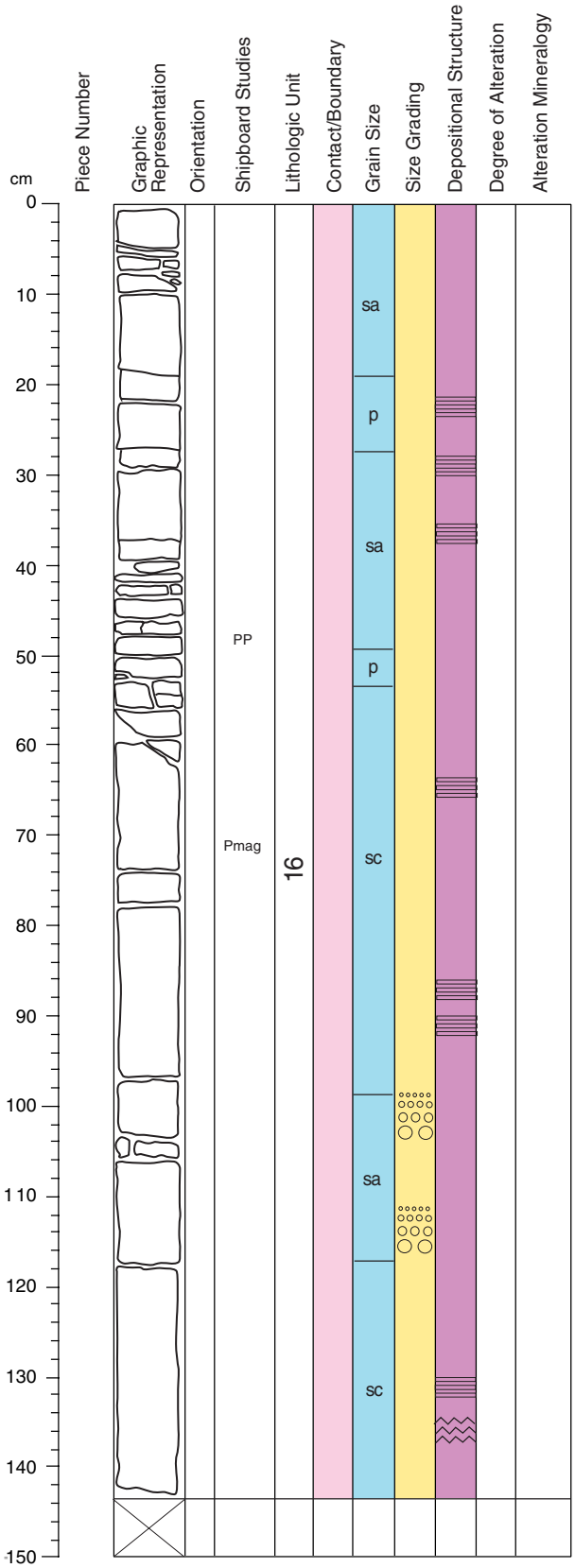
COLOR: Dark gray (N5).

COMPONENTS: Angular to sub-angular, and sub-rounded clasts of green basaltic glass altered to green clay, vesicular basalt, carbonate, green clay and zeolite. Occasionally, rare traces of encrusted Miliolid foraminifers and green algae occur at the top (0-3 cm) and bottom (below 130 cm) of the section, respectively.

SEDIMENTARY TEXTURES: Coarse to fine-grained basaltic glass grains ranging from 0.5-2 to <0.5 mm.

SEDIMENTARY STRUCTURES: Horizontal beds faintly stratified and laminated (i.e., at 0 45, and 100-130 cm) to massive.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-4 (Section top: 274.08 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section mainly consists of two horizontal dm-thick beds: a light colored bed at 0-60 cm, and a dark colored one at 60-142 cm. Laminated to massive beds alternate through the entire section. Sand to gravel sized material is calcite concretion that fills interstitial pores along the bedding plane of a ground mass of basaltic glass altered to clay. Contact boundaries are gradational.

COLOR: Black (7.5R 3/0) to very dark gray (10R 3/).

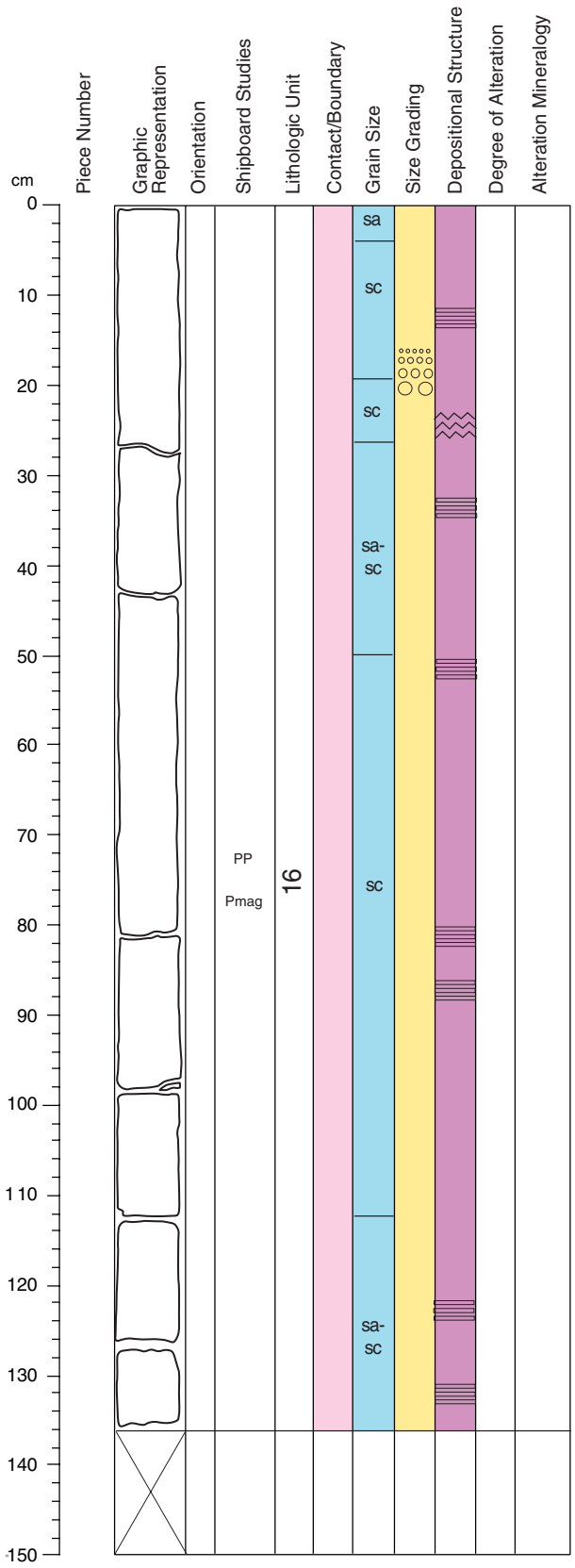
COMPONENTS: Angular to sub-rounded 0.05-1.5 mm clasts of basaltic glass, vesicular basalt, carbonate, clay and zeolite. Bioclasts (i.e, bivalves) are present in trace amount.

SEDIMENTARY TEXTURES: Silt sized volcanic particles.

SEDIMENTARY STRUCTURES: Fine undulating to planar laminations occur at 106-113 cm and 125-133 cm, and vertical burrows occur at 60-142 cm.

COMMENTS: Volcaniclastic-rich sand beds at 106 and 118 cm directly grade into silty clay material.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-34R-5 (Section top: 275.51 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of alternating fine-grained and coarse grained volcaniclastic grainstone, which is barren of microfossils. Planar lamination, mostly in finer intervals. Sharp contacts are at bottom of a fining upward bed of sand-sized particles at 24 and 112 cm.

COLOR: Light greenish (5GY 4/1) and dark gray (N5).

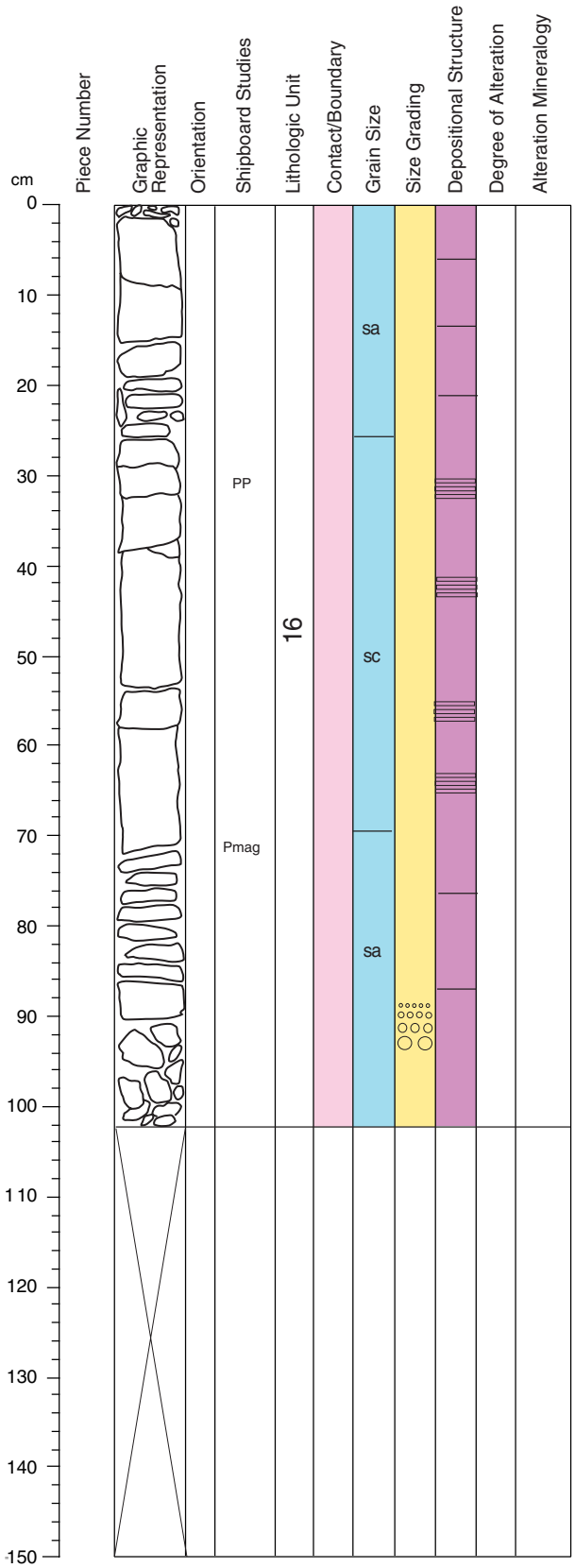
COMPONENTS: Beds consist almost entirely of fine silt to silt-sized volcaniclastic green glassy (basaltic glass) particles which are partially altered to green clay. Calcite is present, but in small amounts (<5%).

SEDIMENTARY TEXTURES: Angular to sub-angular and sub-rounded grains, with reduced intergranular spaces, are partially or totally filled with green clays and zeolite.

SEDIMENTARY STRUCTURES:
Horizontal to inclined sub-mm lamination occurs at 6-9 cm, 44-46 cm, and 110-112 cm. Undulated laminated structures also occur as loading structures at 4, 42, and 97 cm.
A stratified bed of finely laminated/layered altered volcaniclastic-supported grainstone occurs at 112-136 cm. No microfossils or bioclasts can be distinguished for sure, although moderate to strong bioturbation and vertical mm-burrows occur at discrete intervals (i.e., 59-63, and 106-109 cm).

COMMENTS: In this interval the calcareous components might have been strongly syn-post diagenetically altered in relationship with the high-rate deposition of the volcaniclastic material.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-1 (Section top: 277.7 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Coarse sandstone to gravel-sized clast supported conglomerate.

COLOR: Light greenish (5GY 4/1) and dark gray (N5).

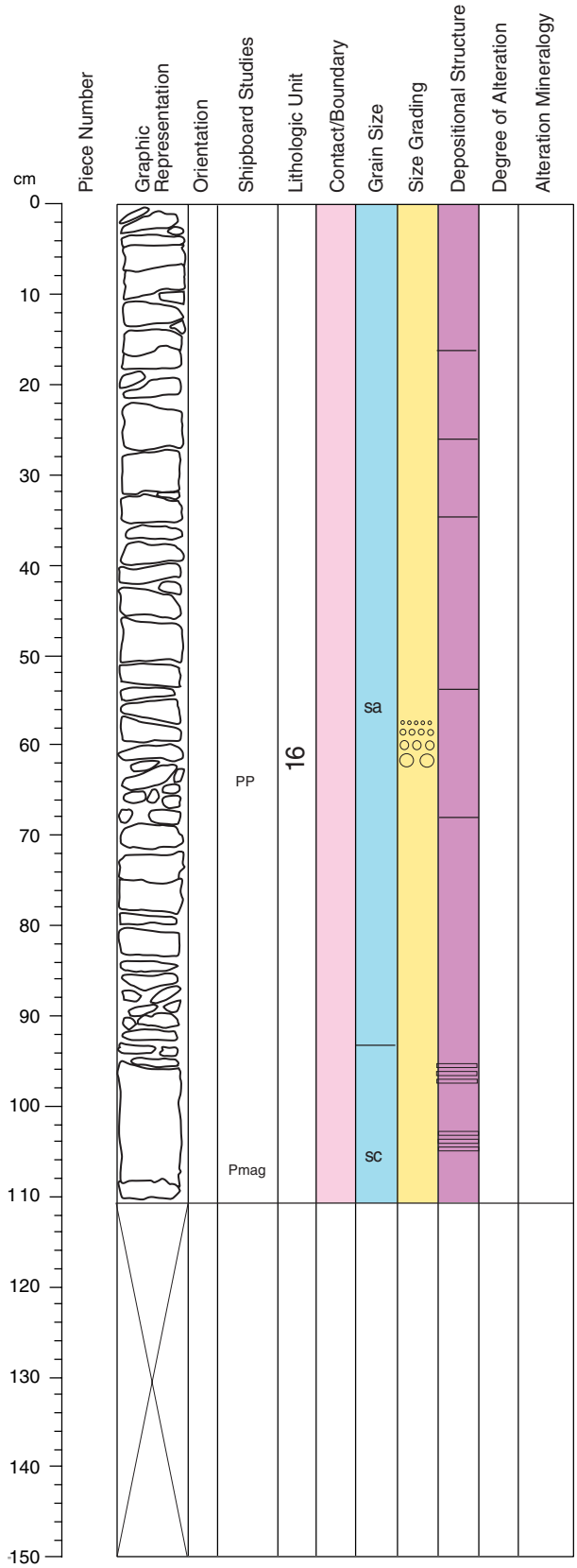
COMPONENTS: Very fine to coarse sand clasts of basaltic glass, vesicular basalt, carbonate, clay, and zeolite, which fill vesicles within the coarse-grained particles.

SEDIMENTARY TEXTURES: Gravel-sized clasts at 20-26 cm. Fine grained (0.5-1.5 mm) at 0-24 cm. Finer-grained (<0.5 mm) at 24-75 cm and gravel-sized clasts at 75-150 cm.

SEDIMENTARY STRUCTURES: Slight bedding with planar lamination mostly occurs in the finer intervals and direct size grading at 92 cm. Cross lamination is at 44 and 60-70 cm. Bioturbation at 45-54 cm.

COMMENTS: This interval is barren of microfossils and bioclasts.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-2 (Section top: 278.7 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of two types of sediment, a structureless volcanic sandstone (at 0-95 cm) and a lighter colored bed of volcanic siltstone containing dispersed fragments of bivalves and microfossils (at 95-130 cm) with sharp contact at the interface with a finer-grained volcaniclastic sandstone (at 95 cm).

COLOR: Light greenish (5GY 4/1).

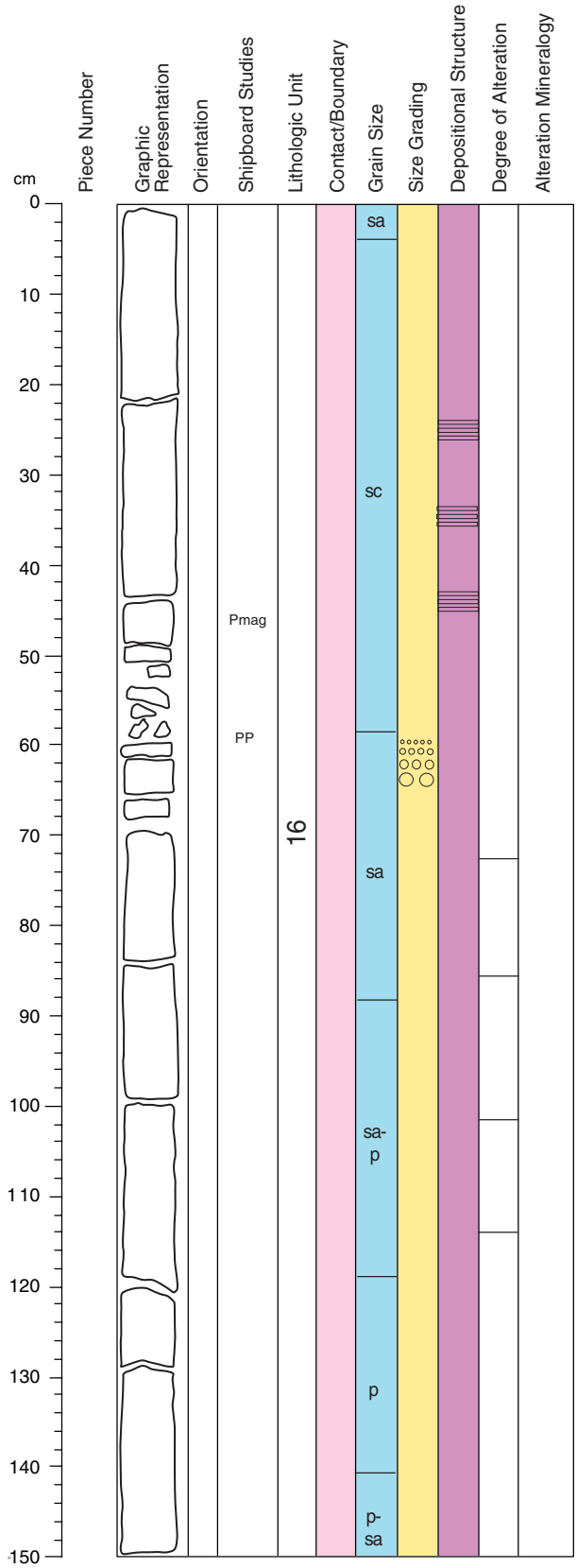
COMPONENTS: a) 0-95 cm: < 2mm $CaCO_3$ (6%), basaltic glass altered to green clay and zeolite and volcanic debris (vesicular basalts =~90%), calcareous microfossils (~2-4%); b) 95-110 cm: Basaltic glass and lithic particles (~80%) dispersed bivalves plus microfossils (~20%).

SEDIMENTARY TEXTURES: Fine to coarse sand-sized particles and lithics.

SEDIMENTARY STRUCTURES: Coarse bedding is present at 66-74 cm. Mm-thick laminations in volcaniclastic siltstone occur at 90-110 cm. and fining upward structures are at 0-90 cm.

COMMENTS: Unidentified calcareous fragments (equally sub mm-sized cylindrical grains) likely derive from fragmentation of larger mm-sized bioclasts (i.e., corals?)

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-3 (Section top: 279.81 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of two dm-thick intervals: 0-70 and 70-150 cm. The latter contains alternating beds (i.e., 77-123, 123-134, 134-150 cm) of conglomerate and light to dark gray, fine to coarse-grained sandstone. This consists of volcanic glass, basalt fragments and rare calcareous organic debris, containing carbonate cement in the sandstone and conglomerate portion.

COLOR: Dark greenish gray (5GY 4/1) at 0-70 cm, and medium light gray (N5) at 70-150 cm.

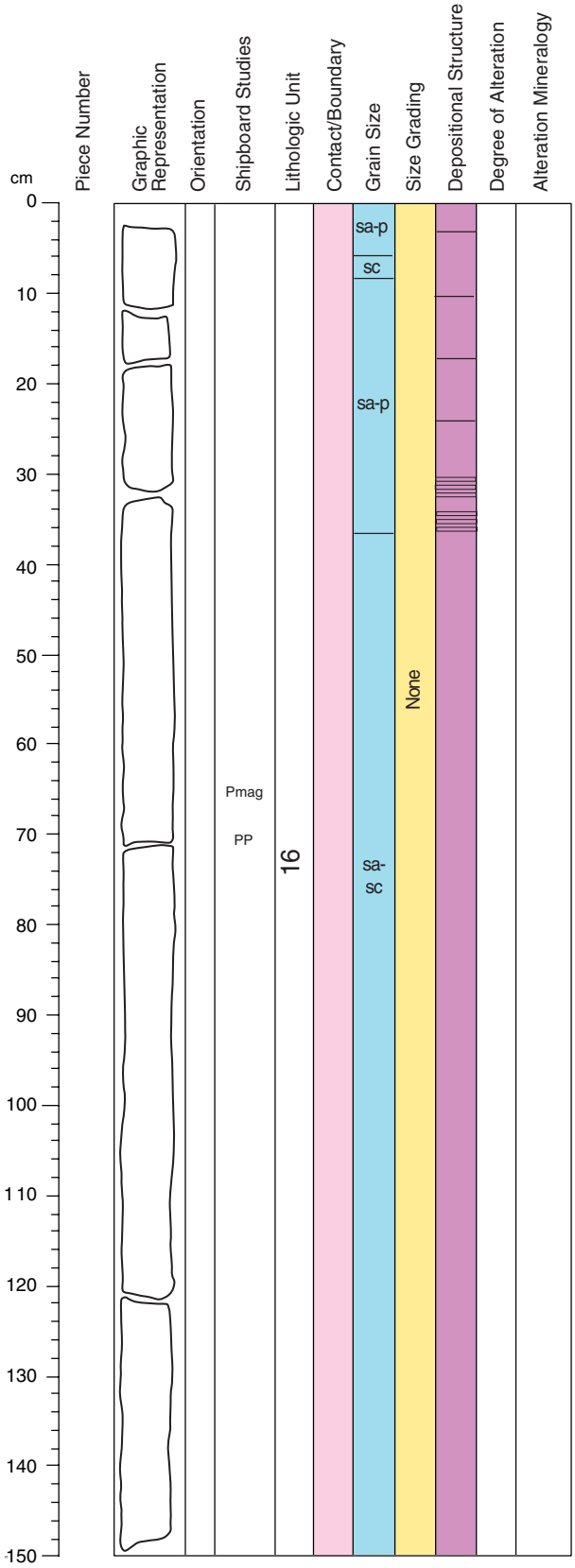
COMPONENTS: The coarser, dark-colored part of this section (70-150 cm) consists of angular to sub-rounded fragments of devitrified volcanic glass (~50%), aphyric, sparsely vesicular basalt (30%), and broken bivalve fragments (10%) dispersed in a carbonate cement. The lighter-colored interval at 0-70 cm is a calcareous, grain-supported volcanic sandstone containing volcanic grains (25%), bioclasts (15%) and benthic foraminifers (e.g., miliolids)(10%), and unidentified calcareous fragments (60%).

SEDIMENTARY TEXTURES: Clast size ranges from 0.2 to 2 mm and >2 mm.
Moderately well sorted silty sandstone are at 0-70 cm. Below poorly sorted, immature coarse grained volcaniclastic sandstone and conglomerate (sub-cm round clasts) occur at 70-150 cm.

SEDIMENTARY STRUCTURES: The upper 35 cm of the section that is structureless and bioturbated (vertical burrows), becomes very finely laminated (sub-mm scale) at 35-48 cm. Between 70 cm and 150 cm, a coarse bedding is defined by 2-5 cm thick layers of gravel to fine sand-sized sandstone. A normally graded conglomerate occurs at 38-84 cm.

COMMENTS: As in Section 2.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-4 (Section top: 281.31 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: In this section massive to sub-horizontally bedded, gray, coarse grained sandstone, is composed of basalt lava fragments. The larger mm-size bioclasts are dispersed through the section, but more concentrated at 9, 26, 40, and 72 to 102 cm. Calcareous cement (spar calcite) is a minor component. Two interfingering lithofacies with gradational contacts between gray and dark gray can be distinguished at 39-150 cm. They are characterized by: a) gray sandstone with different types of volcaniclastic lithics and abundant biogenic grains, and b) dark gray volcanic grains altered to clay with low percentages of microfossils and bioclasts.

COLOR: Medium light gray (N5), and gray (5Y 5/1) and to dark gray (N4).

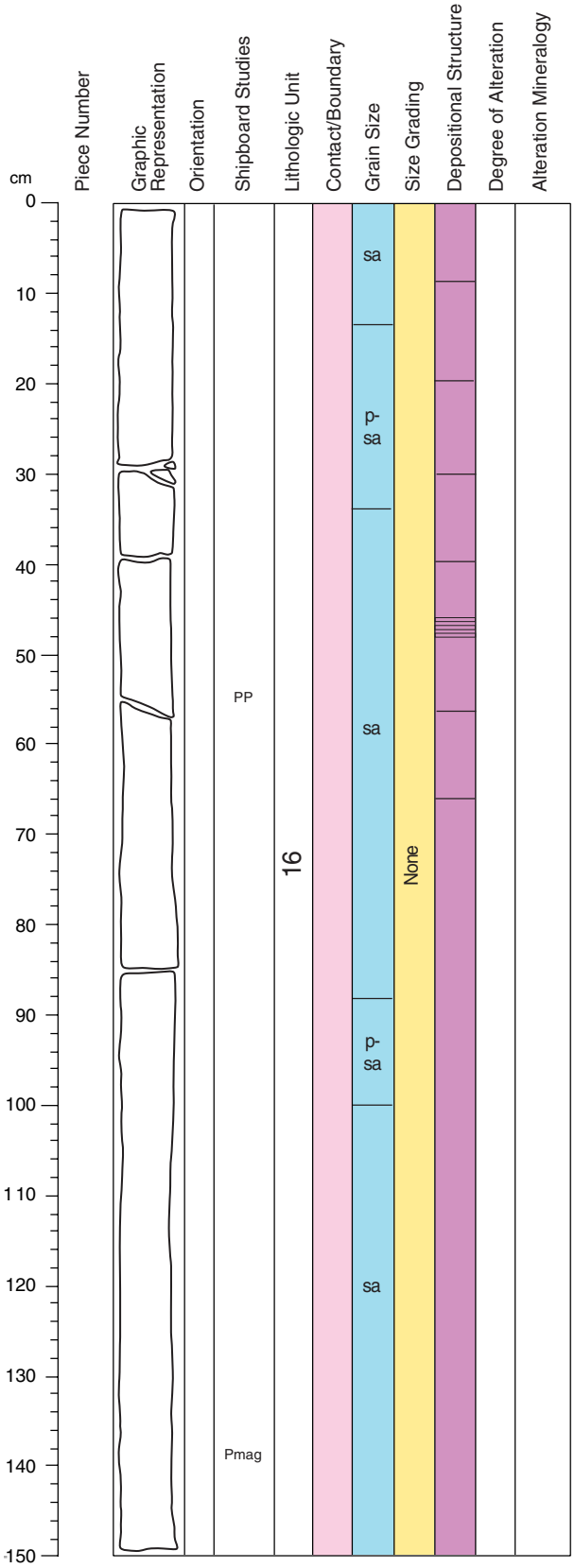
COMPONENTS: At 70-120 cm lithics are rounded volcaniclastic sand and clay (~90%), and calcareous sand-sized grains and bioclasts (10%) occur. At 120-150 cm, dark olive parts contains lithics that are mainly basaltic green glass altered to clay (~80%), calcareous sand sized grains, and bioclasts (~20%). The light gray parts contain angular to subrounded fragments of altered volcanic glass (~20 to 80%), mafic rocks, fine grained, vesicular basalt (~60%), and carbonate bioclasts (bivalves and corals). The lithic components occur together with up to 20% of calcareous microfossils (mostly calcareous grains of Miliolid foraminifers).

SEDIMENTARY TEXTURES: Clasts-supported, poorly sorted, and compositionally immature sandstone. Some imbrication of the larger clasts are present in the upper 40 cm. In the bottom part most of the volcanic clasts are 0.5-2 mm-sized, and rarely, up to 3 cm-sized rounded clasts of vesicular basalt are present.

SEDIMENTARY STRUCTURES: In the upper 39 cm a dm scale sub-horizontal bedding is defined by alternating layers of gravel (at 32-39 cm) to fine-grained sand (0.5-3 mm). Bioturbation at 6-7 cm. Interfingering structures occur at 39-150.

COMMENTS: The biogenic fraction contains poorly preserved calcareous spicules, aragonite needles (from coral skeletons?), rare green algae, and ~2 mm-sized bioclasts (coral) dispersed throughout the section. Miliolid foraminifers are typically common in back reef or bank facies.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-5 (Section top: 282.81 mbsf)

UNIT 16: VOLCANICLASTIC GRAINSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: Clast supported volcaniclastic sandstone. Contacts between beds are sharp to gradational.

COLOR: Gray (N6).

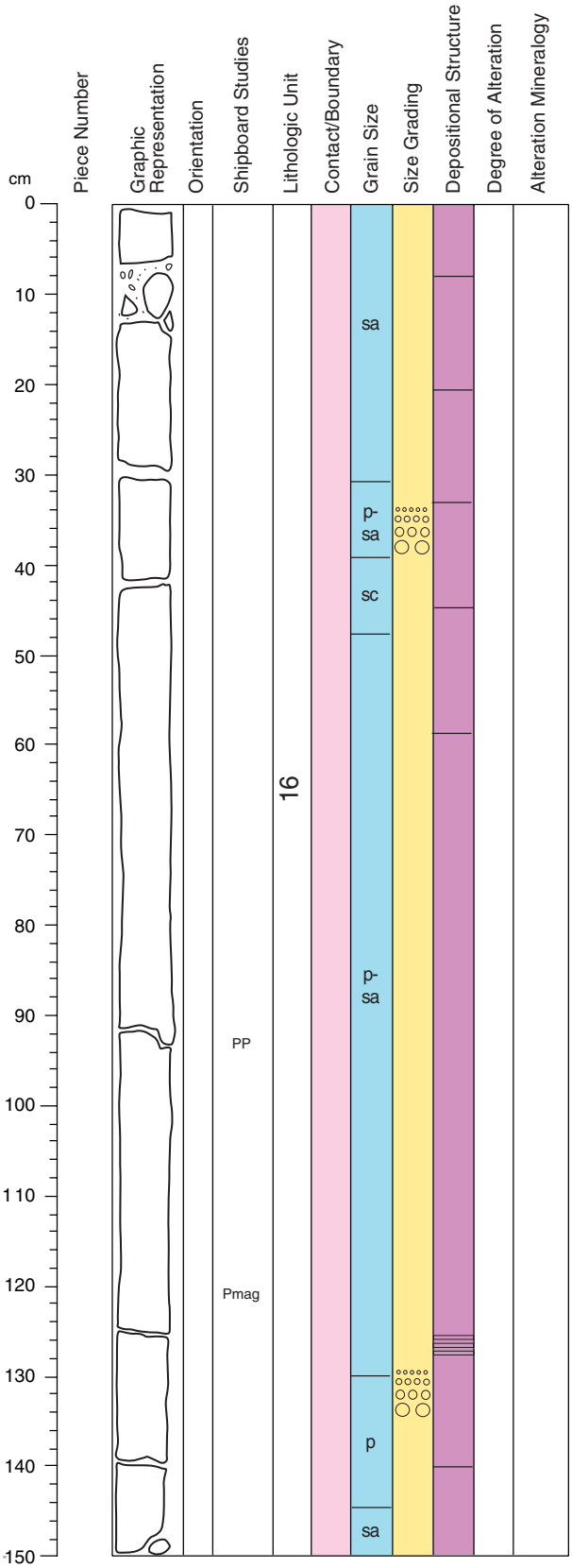
COMPONENTS: As in Section 4. Mm-sized bioclasts are more concentrated at 3-9, 19-24, 59-62, 88-98, and 116-145 cm.

SEDIMENTARY TEXTURES: Poorly sorted (clast supported) 0.5 to 4 mm-sized
grainstone.

SEDIMENTARY STRUCTURES: Mostly massive, but some poorly formed sub-horizontal bedding at 20-90 cm. Undulating, slightly microfaulted lamination. At 44-84 cm sized inclined, undulated (loading structures) lamination that become horizontal downward alternating brown (i.e., at 122-150 cm) and dark gray beds (i.e., at 102-122 cm). Downward the 84-92 cm interval, less sorted and massive structure become bioturbated.

COMMENTS: No size grading observed.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-6 (Section top: 284.31 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This section consists of alternating cm to dm-thick beds of poorly sorted, variably structured sand to gravel-sized volcaniclastic sandstone with varying amounts of microfossils and bioclasts (i.e., at 44-71 cm).

COLOR: Gray (N6 and 5Y/1) and dark gray (N6) to black (7.5R 3/0).

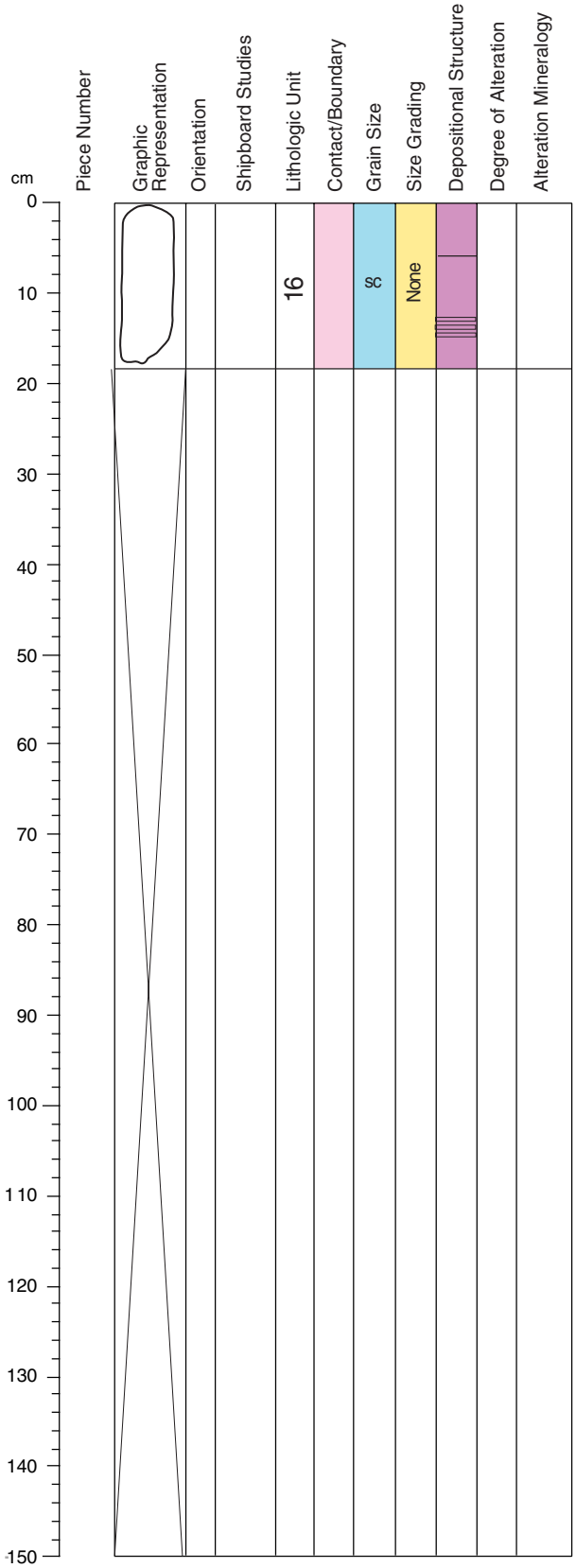
COMPONENTS: Angular to sub-rounded sub-cm to cm-sized clasts of basaltic glass, vesicular basalt, carbonate, and bioclasts cemented by carbonate. Biogenic grains consist of Miliolid foraminifers, bioclasts (e.g., bivalves, echinoderms, and rare mm-sized coral fragments).

SEDIMENTARY TEXTURES: Poorly sorted, 0.5-3 mm-sized volcanic grain supported grainstone. Two cm-sized sub-rounded clasts occur at 134-138 cm.

SEDIMENTARY STRUCTURES: Massive at 0-30 cm; bedding is slightly sub-horizontal to horizontal below 30 cm with directly graded beds at 42, 82, 97 and 144 cm. Beds can contain sand to gravel sized layers with varying amount of bioclasts. Below 70 cm, structures vary. A repeated sequence of inclined bed of coarse sand-sized (at 70-100 cm) is followed by a vertically burrowed interval (at 100-115 cm). Further, a slightly stratified dark sandstone (at 115-127 cm) bed becomes gravel-supported conglomerate and is underlined by a normally sized-graded bed at 136-146 cm.

COMMENTS: As in Section 2.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-35R-CC (Section top: 285.81 mbsf)

UNIT 16: VOLCANICLASTIC SANDSTONE.

Pieces: N/A. Cut as a sediment core.

CONTACTS: None.

GENERAL DESCRIPTION: This interval contains volcanic grains (at 1-4 cm) and calcareous grains (at 4-17 cm) in volcanic sandstones with gradational contacts.

COLOR: Gray (N6) to dark very gray.

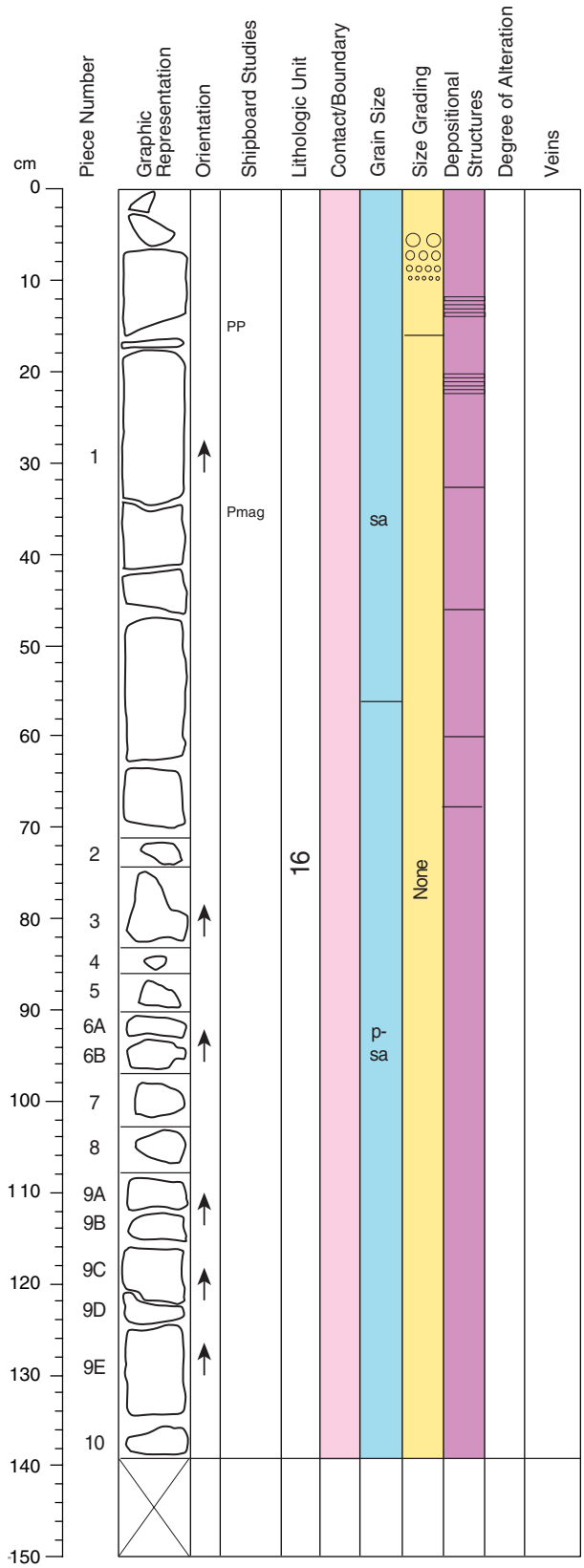
COMPONENTS: Angular to subrounded sub-cm to cm-sized lithics of basaltic glass, vesicular basalt, carbonate (40 to 60% at 4-17 cm), mixed Miliolid foraminifers, and calcareous sand sized grains (40 to 60% at 1-4 cm) more or less cemented by spar calcite.

SEDIMENTARY TEXTURES: Poorly sorted and grain supported. Fine to coarse sand and gravel-sized (>2mm).

SEDIMENTARY STRUCTURES: Massive to faintly laminated. Cm-thick, inclined bed at the bottom with layers directly size sorted. Bioturbation in the massive bed at 5 to 8 cm.

COMMENTS: More detrital calcite occurs in the sand-sized grainstone at the top.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-36R-1 (Section top: 287.3 mbsf)

UNIT 16: LITHIC-VITRIC SANDSTONE.

Pieces: 1-10

CONTACTS: None

GENERAL DESCRIPTION: This core interval consists of, from top to bottom: Dark gray (5Y 4/1) to very dark greenish gray (4/10 BG), clearly laminated medium to fine sandstone (Piece 1; 0-18 cm); altered structureless to weakly laminated, fine to coarse sandstone (Piece1; 18 25 cm); 3 cycles of increasing overall grain size, 7-15 cm thick, moderately well sorted sandstone (Piece 1; 25-70 cm); same sandstone as matrix to basalt cobbles (Piece 2-10; 70 138 cm).

COLOR: Dark gray (5Y 4/1) to dark greenish gray (4/BG) to very dark greenish gray (4/10 BG)

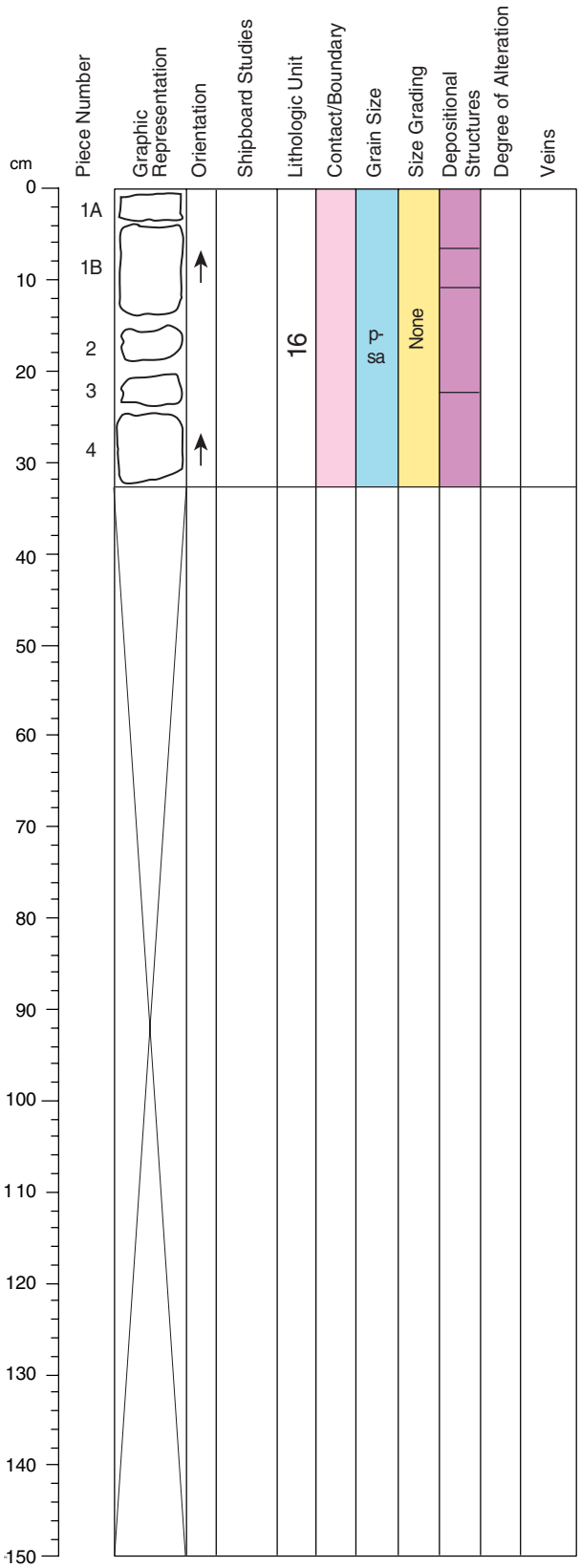
COMPONENTS:
0-18 cm: 30% calcite, 25% shell debris, 20% basalt fragments, 15% volcanic glass, 10% foraminifers.
18-138 cm: 30% calcite, 10% shell debris, 10% basalt fragments, 40% volcanic glass (mostly altered) 10% olivine.

SEDIMENTARY TEXTURES:
0-18 cm: Fine to medium sandstone, well sorted;
18-25 cm: Medium to coarse sandstone, moderately well sorted;
25-70 cm: Medium to coarse sandstone, moderately well sorted;
70-138 cm: Medium to coarse with large shell fragments.

SEDIMENTARY STRUCTURES:
0-18 cm: Finely laminated sandstone;
8-25 cm: Weakly laminated to structureless sandstone;
25-70 cm: Weakly laminated to structureless sandstone;
70-138 cm: Structureless to flow patterns around basalt clasts.

COMMENTS: Large shell fragments at 38-41 cm and within the cobble matrix at 62-138 cm. Lamination at 0-18 cm has a dip of 14°. Smectite rims around lithic and volcanic glass fragments. This is a relatively high energy environment with moderate sedimentation rate and reworking of sediment components within a limited area. Interval at 108-133 cm: (only 40% matrix sandstone between basalt clasts): 70% calcite, 10% basalt fragments, 10% shell debris. Basalt clasts: At 62 cm: Basalt cobbles start to appear. All basalt clasts in 30R, Section 1 and 2, are highly olivine-phyric and are derived from underlying Unit 17. The olivine phenocrysts are completely altered to iddingsite, Fe oxyhydroxide, yellow green clay and green gray clay.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-36R-2 (Section top: 288.69 mbsf)

UNIT 16: VOLCANICLASTIC SANDSTONE.

Pieces: 1-4

CONTACTS: None. The boundary between Units 16 and 17 is inferred to be between bottom of Section 36R-2 and top of 36R-3, where the lithology changes from sandstone to coherent lava.

GENERAL DESCRIPTION: This core interval consists of medium grained, moderately well sorted dark greenish gray sandstone with large (2-5 cm) basalt cobbles.

COLOR: Dark greenish gray (4/BG).

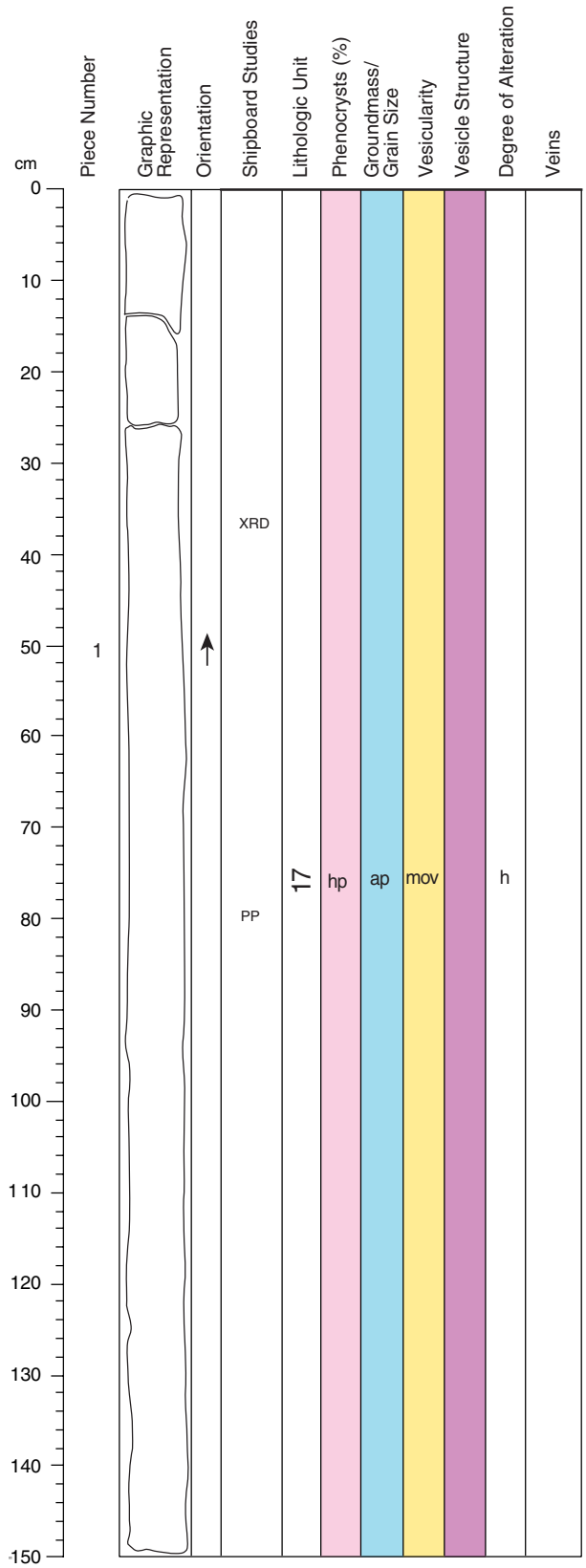
COMPONENTS: 30% calcite, 10% shell debris, 20% basalt fragments, 30% volcanic glass.

SEDIMENTARY TEXTURES: Medium grained sandstone, moderately well sorted.

SEDIMENTARY STRUCTURES: Sandstone in a chaotic ‘melange’.

COMMENTS: This is a continuation of the sandstone, with basalt clasts, from Section 1.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-36R-3 (Section top: 289.01 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None observed. The boundary between Unit 16 and Unit 17 is inferred to be at the top of Core 36R-3.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	1	2	Subhedral to anhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	5	Highly irregular

COLOR: Medium light gray (N5).

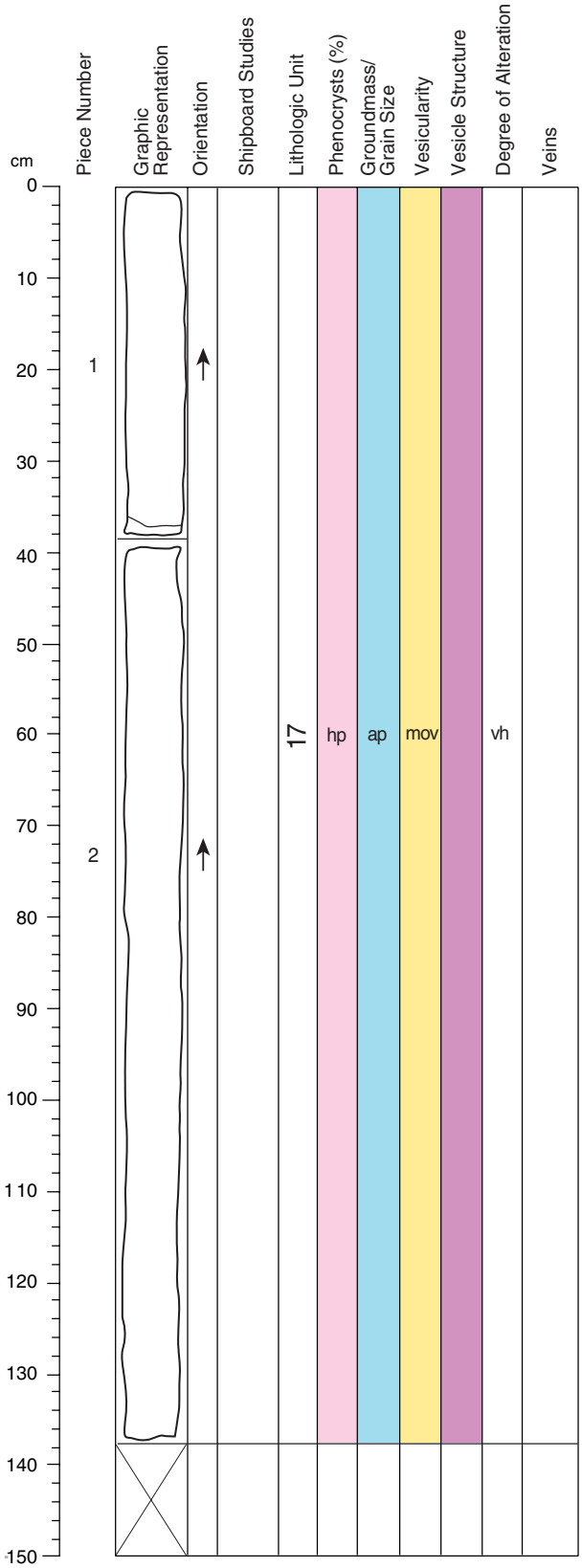
STRUCTURE: Massive prior to disintegration.

ALTERATION: Very high. Olivine microphenocrysts are totally altered to a soft and expanding pale yellowish green clay (10GY 7/2). Their rims and internal fractures are outlined by orange brown iddingsite. Vesicles are filled with soft gray-green clay; larger (5-10 mm) vesicles are filled with carbonate.

VEINS/FRACTURES: None.

COMMENTS: Most of this section has disintegrated into sand and gravel because of expanding clays. Vesicles are larger (5-10 mm) from 26-85 cm. Although completely altered, the olivine phenocrysts contain inclusions of black chromite.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-36R-4 (Section top: 290.51 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-2

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	1	2	Subhedral to anhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	5	Highly irregular

COLOR: Black (2.5Y 2/0).

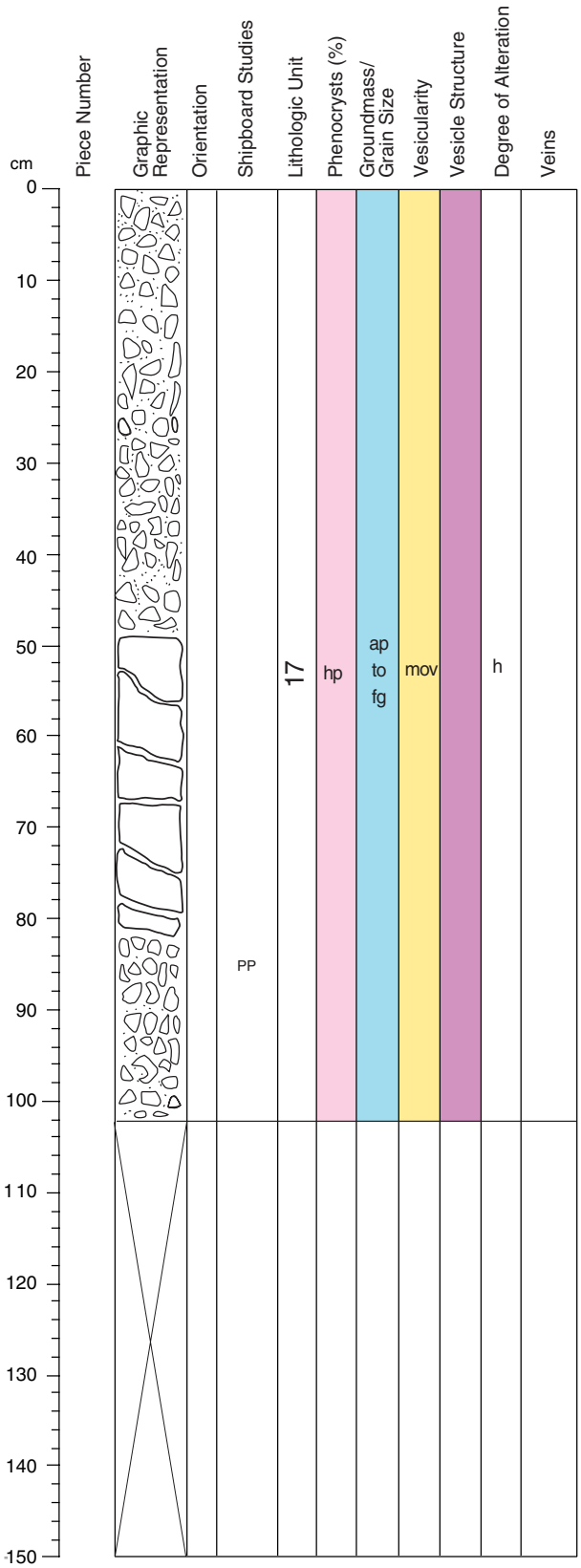
STRUCTURE: Massive prior to disintegration.

ALTERATION: Very high. Olivine microphenocrysts are totally altered to a soft and expanding pale yellowish green clay (10GY 7/2). Their rims and internal fractures are outlined by orange brown iddingsite. Vesicles are filled with soft gray-green clay. The largest vesicles (5 10 mm) are filled with carbonate.

VEINS/FRACTURES: None present.

COMMENTS: Bottom of Piece 1 has a 5-7 mm layer of very fine-grained and laminated carbonate grading in color from moderate orange pink (5YR 8/4) to brown (2.5Y 4/2).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-37R-1 (Section top: 291.9 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	1	2	Anhedral to Euhedral

GROUNDMASS: Aphanitic to fine-grained. The groundmass contains plagioclase, clinopyroxene, and altered glass.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	15	3	Irregular

COLOR: Dark gray (N3).

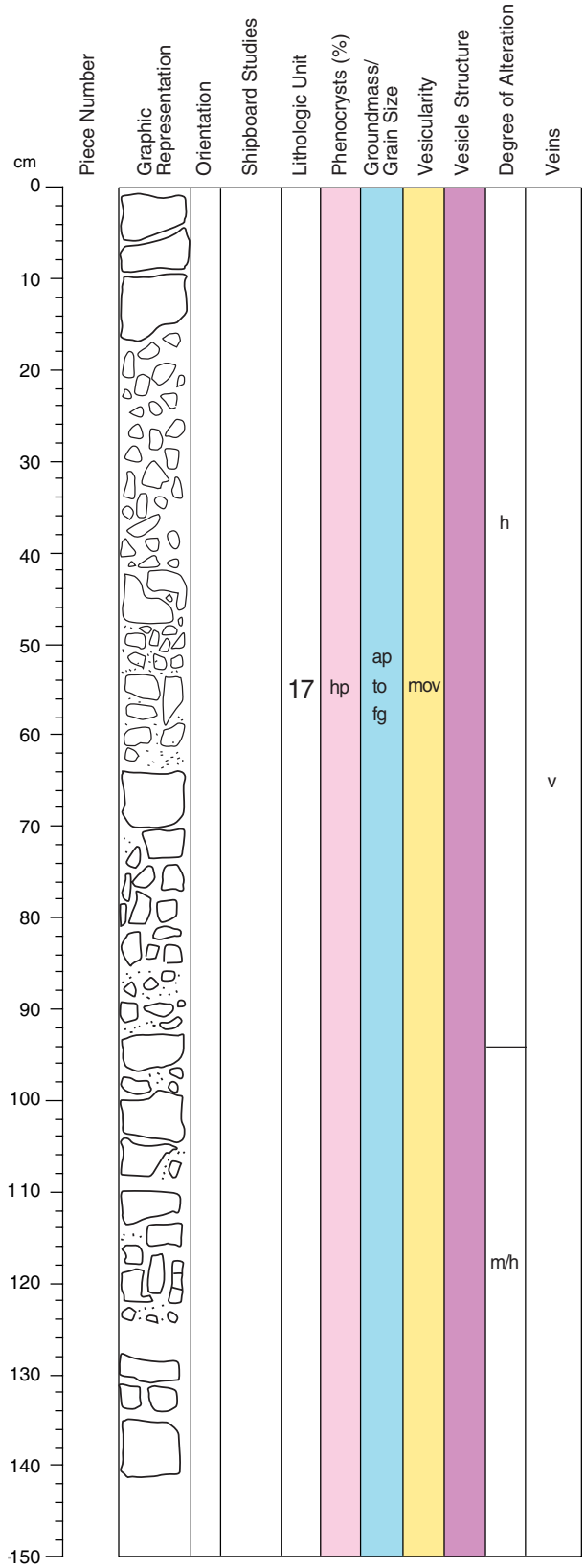
STRUCTURE: Massive prior to disintegration.

ALTERATION: High. Most olivine phenocrysts are totally altered to a soft and expanding pale yellowish green clay (10GY 7/2). Their rims and internal fractures are outlined by orange brown iddingsite. Some olivine phenocrysts are less altered to yellowish brown. Glass in the groundmass is altered to gray green clay. Vesicles are filled with soft pale green clay.

VEINS/FRACTURES: None.

COMMENTS: The whole section disintegrated into sand and gravel because of expanding clays.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-37R-2 (Section top: 292.91 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	1	2	Anhedral to Euhedral

GROUNDMASS: Aphanitic to fine grained. The groundmass contains plagioclase, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	15	3	Irregular

COLOR: Dark gray (N3).

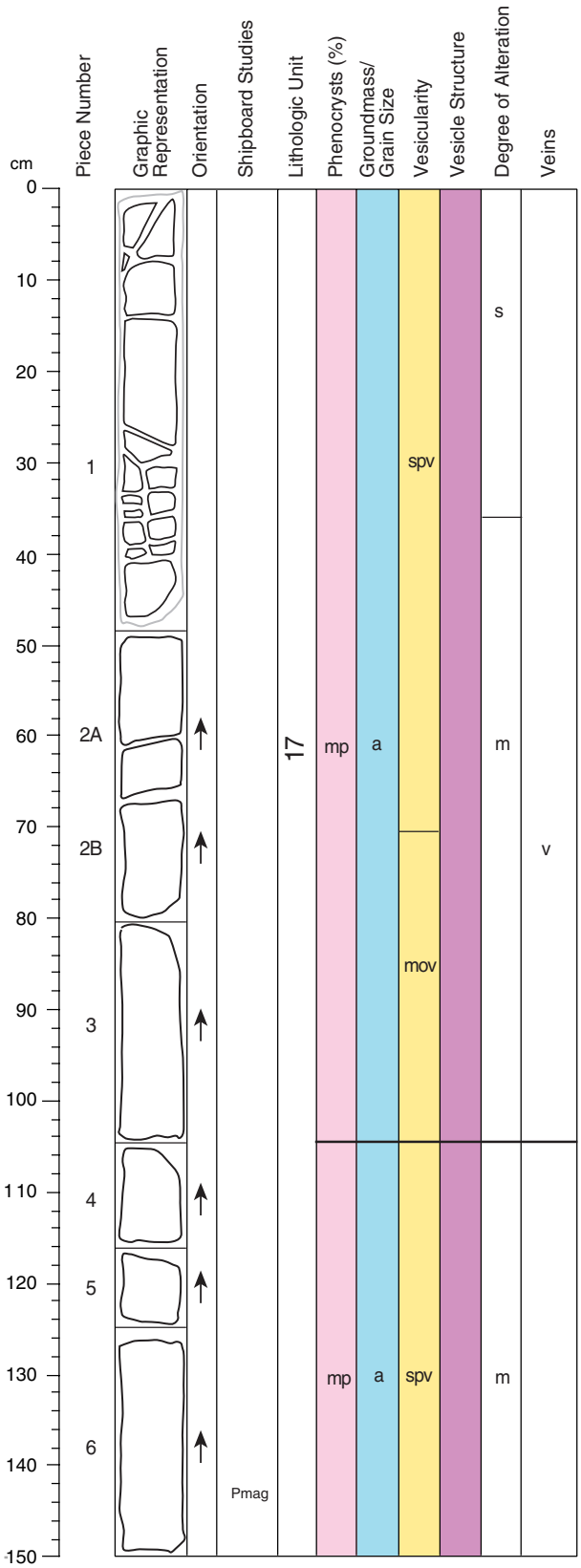
STRUCTURE: Massive prior to disintegration.

ALTERATION: High to moderate. Some olivine phenocrysts are totally altered to a soft and expanding pale yellowish green clay (10GY 7/2). Their rims and internal fractures are outlined by orange brown iddingsite. Most olivine phenocrysts are less altered to Fe oxyhydroxide or are unaltered. Mesostasis in the groundmass is altered to gray dark clay. Vesicles are filled with soft pale green clay.

VEINS/FRACTURES: Sparsely veined throughout.

COMMENTS: The whole section disintegrated into sand and gravel because of expanding clays.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-37R-3 (Section top: 294.41 mbsf)

UNIT 17: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	9	5	1	2.5	Euhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
0-70 cm	3-4	3	Round to elongate
71-150 cm	5-10	4	Round to elongate

COLOR: Dark gray (N3).

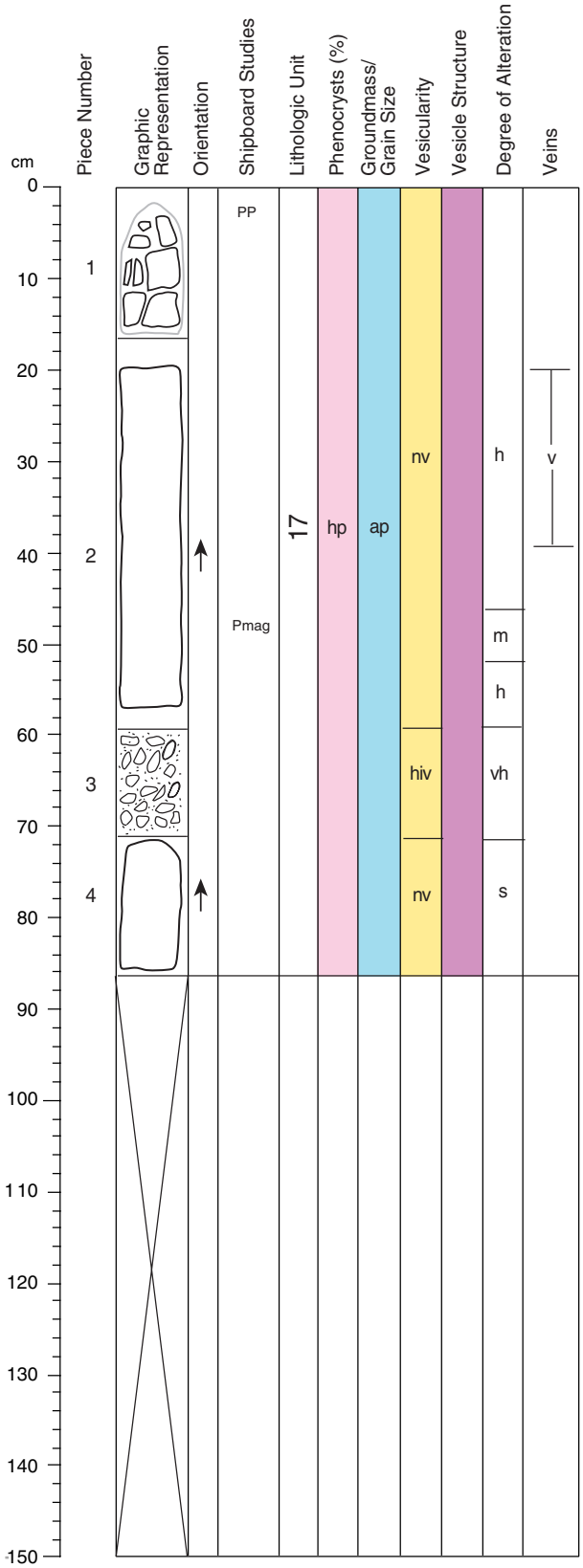
STRUCTURE: Lobed, based on the presence of a lobe margin between Pieces 3 and 4 (at 104 cm).

ALTERATION: Slight to moderate. The alteration color changes from gray to red towards the base. Some olivine phenocrysts are totally altered to a soft and expanding pale yellowish green clay. Their rims and internal fractures are outlined by orange brown iddingsite. Mesostasis in the groundmass is altered to gray dark clay. Vesicles are filled with soft pale green clay.

VEINS/FRACTURES: Sparsely veined. A 3 mm wide white carbonate vein is present in Piece 2B at 74 cm.

COMMENTS: From 75-116 cm, the lava has a brecciated appearance, and consists of scoriaceous clasts up to 30 mm in size, separated by carbonate-filled voids. In detail, these voids are up to 50 mm in width, and consist of green soft clay at the base (looks like a chemical precipitate rather than a fine sediment) overlain by fine grained carbonate sediment that displays normal grading. This may imply that the sedimentary infill occurred after burial and early diagenesis followed by uplift. The brecciation in the interval 75-104 cm represents the basal breccia, whereas the breccia from 104-116 cm represents the breccia at the top of the underlying lobe. There is a corresponding increase in red color towards the base of the section, indicating an oxidized lobe top.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-37R-4 (Section top: 295.91 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	%	Grain Size (mm):			
	Mode	Max.	Min.	Avg.	Shape/Habit
Olivine	12-15	6	1	2	Euhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	%	Size (mm):	
	Mode	Average	Shape
0-60 cm	<<1	<1	Round
61-70 cm	>25	1-2	Round
71-86 cm	<<1	<1	Round

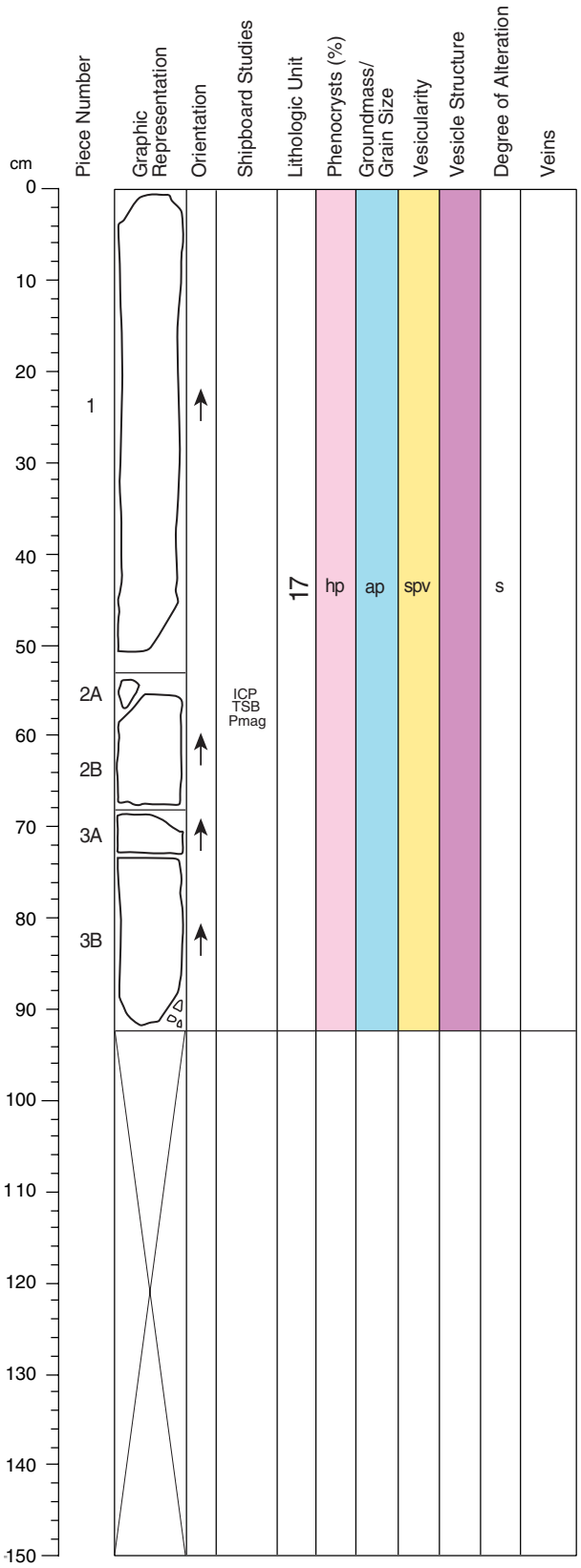
COLOR: Dark gray (N3) in Piece 4 to grayish red (10R 4/2) in Pieces 1-3.

STRUCTURE: Lobed, based on the presence of a lobe margin in Section 37R-3.

ALTERATION: Slight to high. High in Piece 3 which consists of clay-rich highly altered fragments. The reason for the high degree of alteration compared to the rest of the section is not clear, but may be due to an increase in vesicularity leading to an increase in clay (infilling vesicles). This is unconfirmed as the piece is too disaggregated to ascertain vesicularity. The alteration color is brown red for Pieces 1-3, indicating an oxidized lobe top. Olivine phenocrysts are totally altered to a pale yellowish green clay and rarely white carbonate. Their rims and internal fractures are outlined by orange brown iddingsite. Mesostasis in the groundmass is altered to dark gray clay. Vesicles are filled with soft pale green clay.

VEINS/FRACTURES: Sparsely veined. A 3 mm wide white carbonate vein is present in Piece 2.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-38R-1 (Section top: 296.9 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	0.5	2	Subhedral, anhedral and platy

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Irregular

COLOR: Medium light gray (N6).

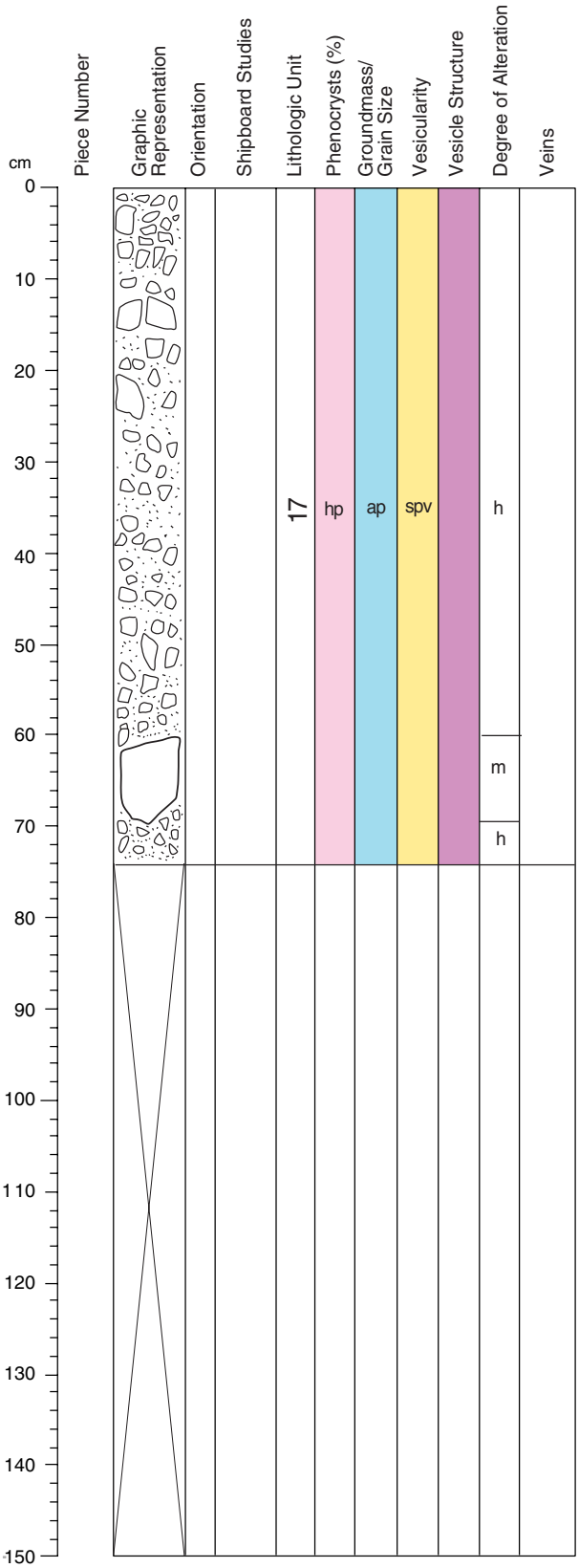
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are typically unaltered but some have rims of blue green clay. Vesicles are filled with blue green clay and carbonate.

VEINS/FRACTURES: None.

COMMENTS: Most of the olivine is unaltered (olive green) with inclusions of black chromite. Size population may be bimodal. Some of the olivine forms up to ~4 mm long, 1 mm wide blades.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-38R-2 (Section top: 297.81 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: None. Cut as sediment core.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	0.5	2	Subhedral, anhedral and platy

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Irregular

COLOR: Medium light gray (N6) to black (5Y 2.5/1).

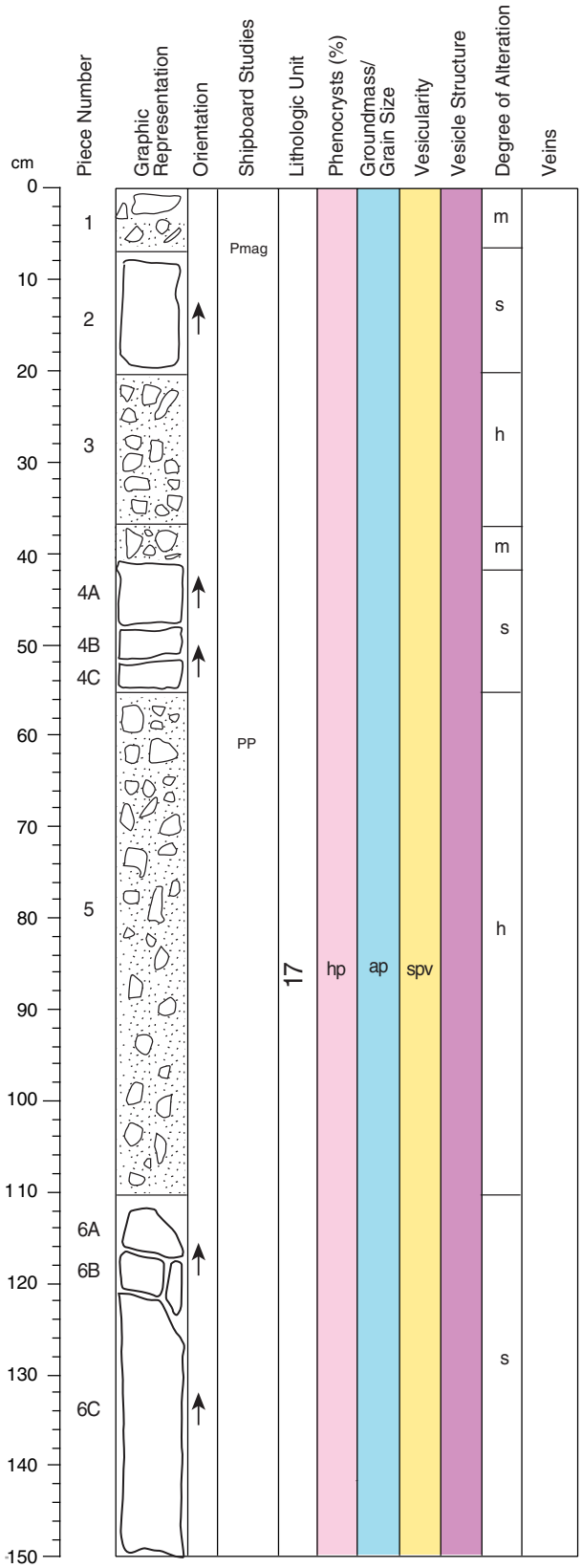
STRUCTURE: Fragmented.

ALTERATION: Moderate to high. From 60-68 cm olivine phenocrysts are typically unaltered but some have rims of blue green clay. The black fragmented portion of the core (caused by expanding clay) contains unaltered and altered olivines. Vesicles are filled with blue green clay and carbonate.

VEINS/FRACTURES: None.

COMMENTS: From 60-68 cm many of the olivines are unaltered (olive green) with inclusions of black chromite. Size population may be bimodal.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-38R-3 (Section top: 298.54 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine	15	5	0.5	2	Euhedral to subhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:

	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	1.5	Irregular to round

COLOR: Medium light gray (N6).

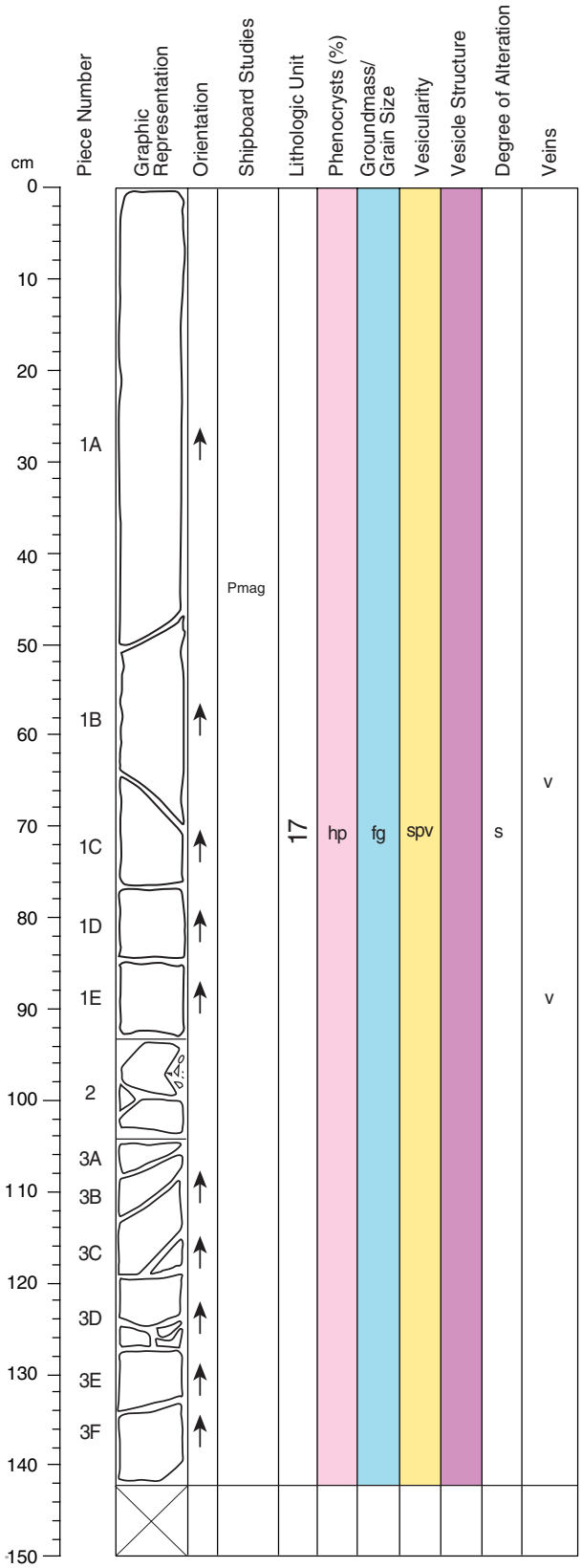
STRUCTURE: Massive.

ALTERATION: Slight to high. Highly altered in Pieces 3 and 5, which are totally disaggregated to a clay-rich breccia. Olivine phenocrysts are partially altered to white carbonate or blue green clay, but many of the phenocrysts are unaltered, although they are typically rimmed with dark green clay. Olivine is equally altered in the highly altered brecciated pieces and the less altered pieces. Vesicles are filled with blue green clay and carbonate.

VEINS/FRACTURES: None.

COMMENTS: Olivine phenocrysts contain abundant chromite inclusions.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-38R-4 (Section top: 300.04 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-3

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	20	5	0.5	2	Subhedral, anhedral and platy

GROUNDMASS: Fine grained. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Irregular

COLOR: Light gray (N7).

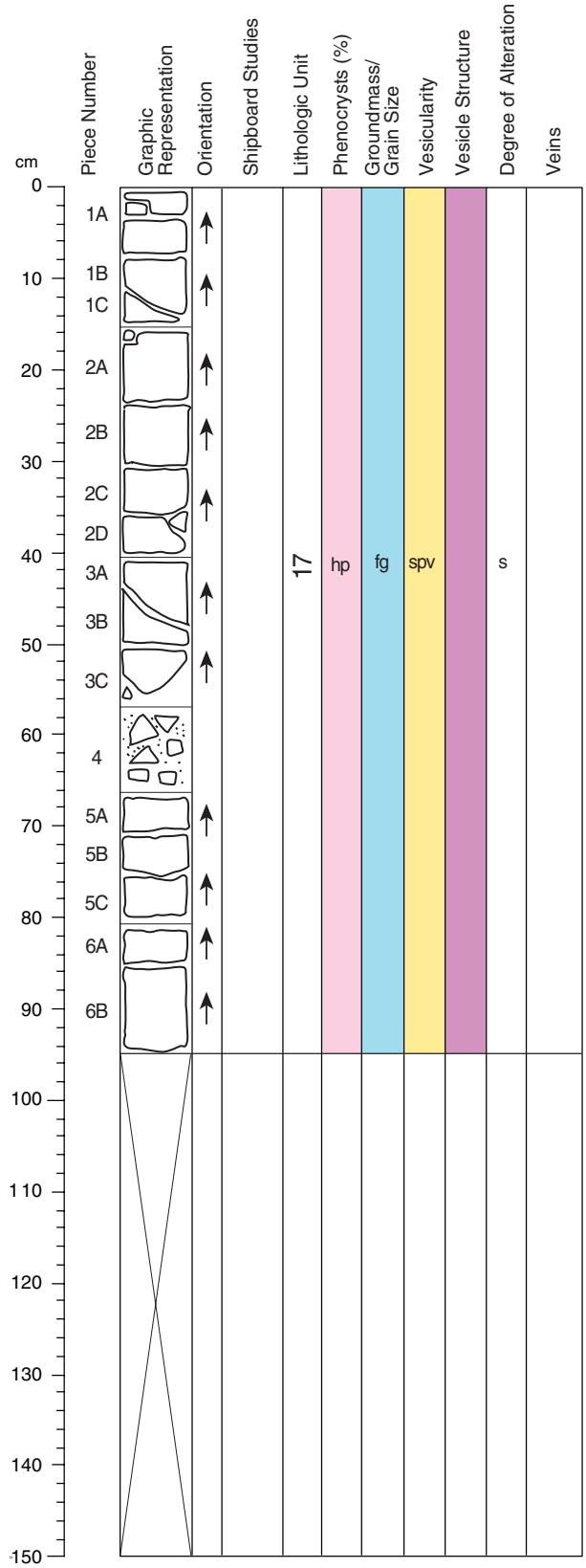
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are typically unaltered but some have rims of Fe oxyhydroxide. Vesicles are filled with pale green and white clay.

VEINS/FRACTURES: Sparsely veined. 2-5 mm wide, randomly oriented veins are present in Pieces 1B and 1E, and are filled with pale green clay.

COMMENTS: Most of the olivines are unaltered (olive green) with inclusions of black chromite. Some opaque minerals are similar in size as the phenocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-38R-5 (Section top: 301.45 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-6

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	20	5	0.5	2	Subhedral, anhedral and platy

GROUNDMASS: Fine grained. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Irregular

COLOR: Brownish gray (5YR 6/1).

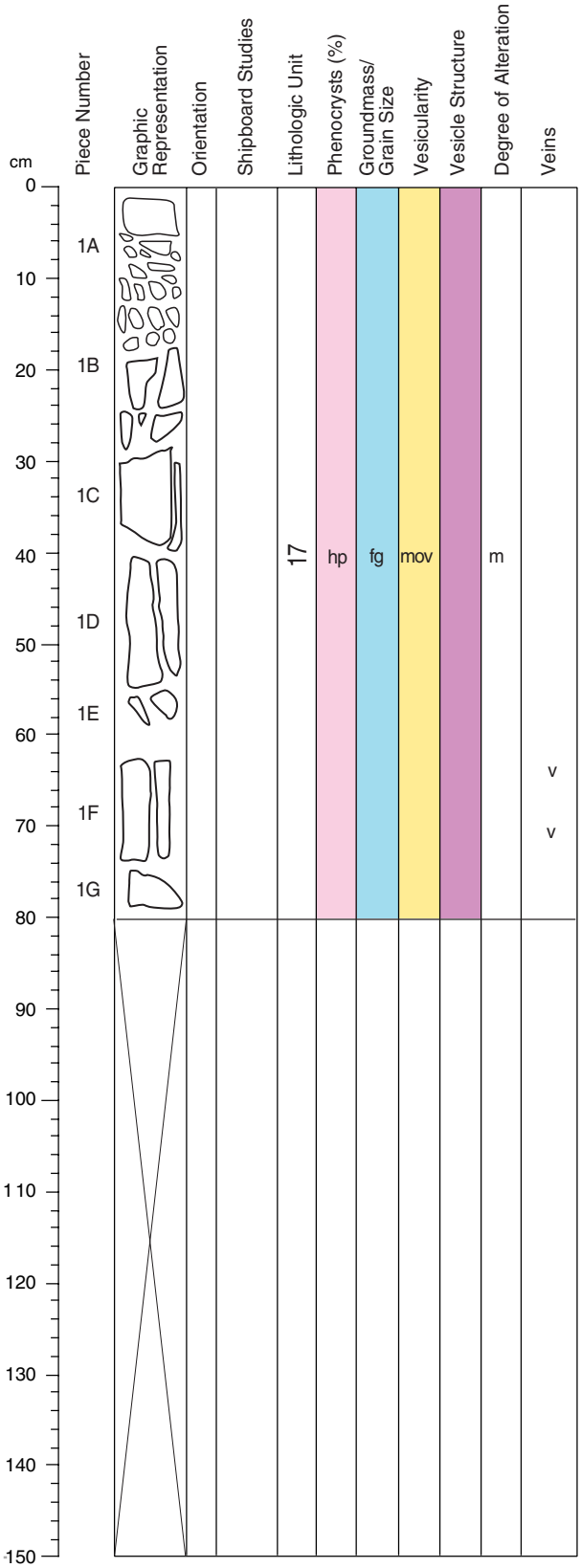
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are typically unaltered but some have rims of Fe oxyhydroxide. Vesicles are filled with pale green and white clay.

VEINS/FRACTURES: Sparsely fractured. <1 mm wide, randomly oriented fractures are present throughout the section.

COMMENTS: Most of the olivines are unaltered (olive green) with inclusions of black chromite. Some platy olivine phenocrysts are 5 mm in size. Groundmass is stained by alteration to brownish gray (5YR 6/1).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-39R-1 (Section top: 301.5 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	20	5	0.5	2	Subhedral, anhedral and platy

GROUNDMASS: Fine grained. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Irregular

COLOR: Brownish gray (5 YR 6/1).

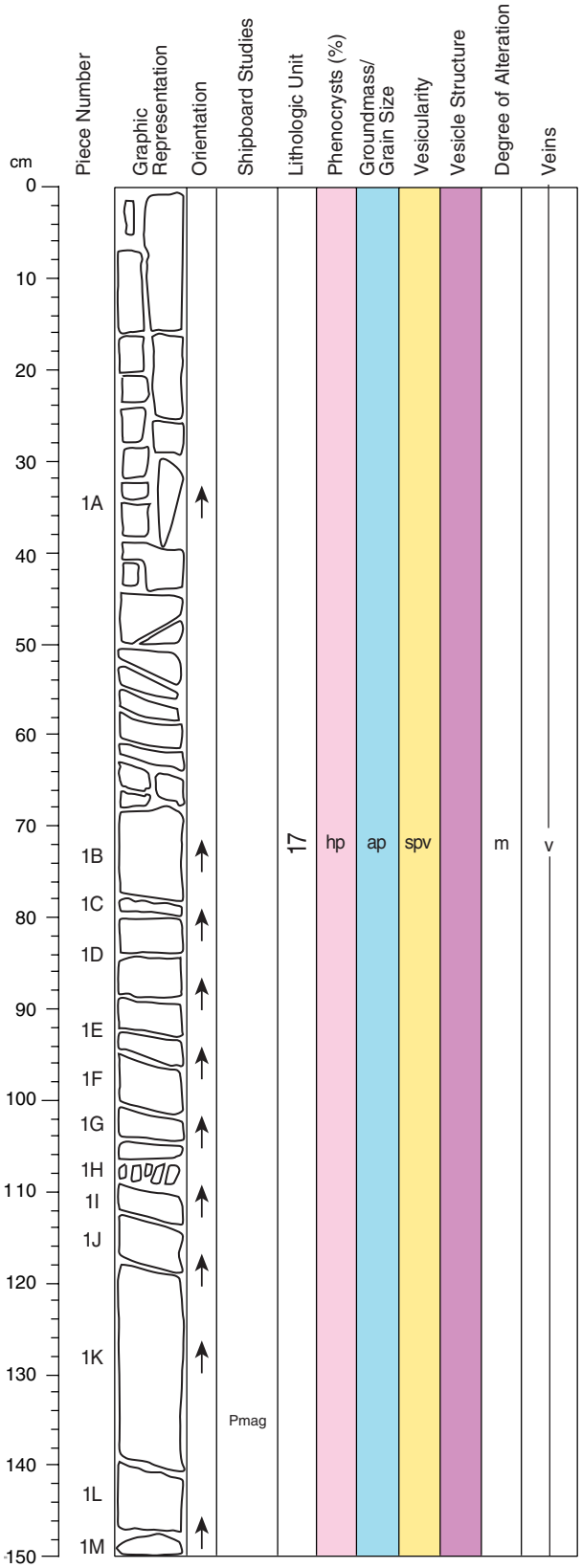
STRUCTURE: Massive.

ALTERATION: Moderate. Most olivine phenocrysts are altered to dark green clay. Some olivine phenocrysts are unaltered, and some have rims of Fe oxyhydroxide and/or dark green clay. Vesicles are filled with pale green and white clay.

VEINS/FRACTURES: Sparsely veined. A 2 mm wide, subvertical vein is present in Piece 1F, and is filled with carbonate.

COMMENTS: Most of the olivines are unaltered (olive green) with inclusions of black chromite. Groundmass is stained by alteration to brownish gray (5YR 6/1). Part of Pieces 1F and 1G are sandstone filling fractures.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-39R-2 (Section top: 302.29 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15-20	12	1	4	Euhedral to subhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and altered mesostasis in an intergranular groundmass.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	1-2	3	Elongate to irregular

COLOR: Light gray (N8) to pinkish gray (N8).

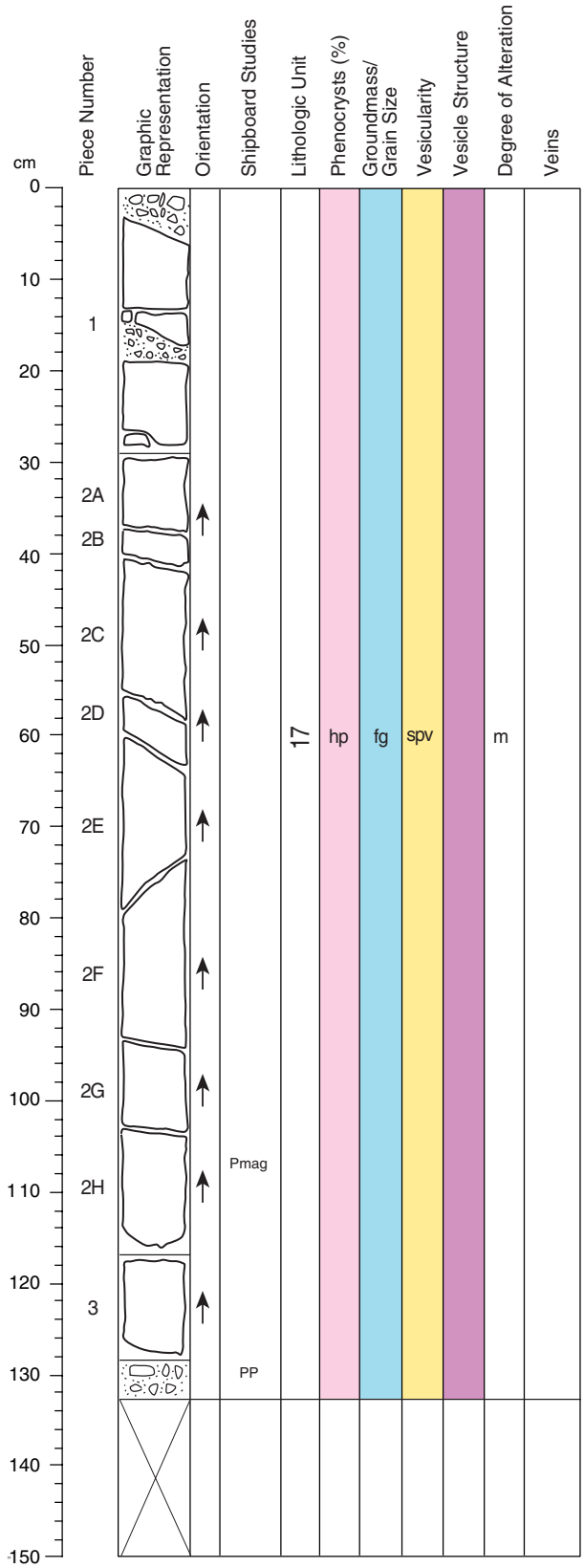
STRUCTURE: Massive.

ALTERATION: Moderate. Fe oxyhydroxide is pervasive. Olivine phenocrysts are partially altered to iddingsite along fractures and around crystal margins. Vesicles are filled with white zeolites.

VEINS/FRACTURES: Highly fractured and sparsely veined. Veins and fractures are subvertical (0-50 cm) to subhorizontal (50-150 cm). Veins are <1 mm wide and filled with green clay and zeolites.

COMMENTS: Volcaniclastic sandstone has filled fractures in the interval 17-40 cm. The sandstone contains subround to subangular, highly to completely altered basalt clasts and fossiliferous carbonate fragments. The cement is green clay and zeolite. Cr-spinel inclusions are present in the olivine phenocrysts. Unaltered olivine relicts are present.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-39R-3 (Section top: 303.79 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15	5	1	2.5	Subhedral; equant

GROUNDMASS: Fine grained. The groundmass contains plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	2	Rounded to irregular

COLOR: Medium light gray (N6).

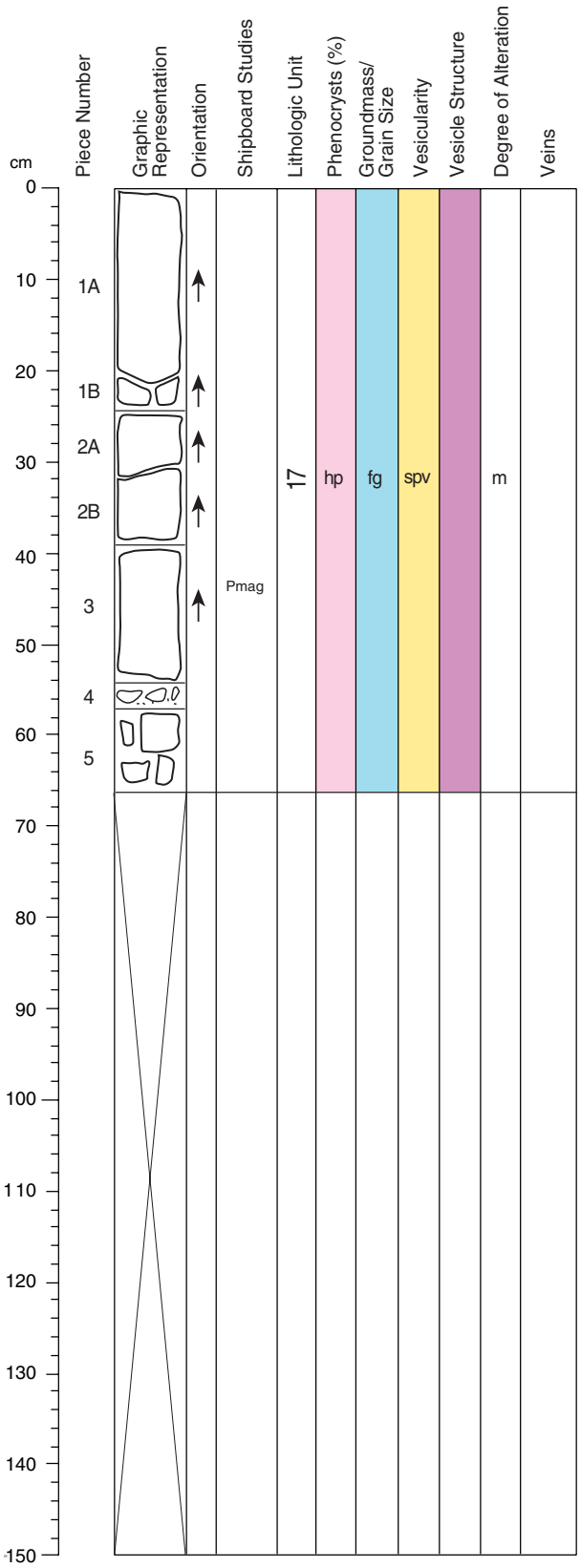
STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are partially altered to iddingsite along fractures and around crystal margins. Vesicles are filled with a soft white clay which expands when wet.

VEINS/FRACTURES: None. However, the rock is highly friable because of alteration of olivine phenocrysts, and the presence of clay-filled vesicles, and fractures easily in all directions.

COMMENTS: A small amount of volcaniclastic sandstone is present in Piece 1. It consists of sand-sized particles of feldspar, altered basalt, and olivine, and some biogenic material. The sandstone appears to be filling a 2-4 cm wide fracture within the basalt, but the rock is highly fragmented, and the relationship between the sandstone and the basalt is not clear.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-39R-4 (Section top: 305.12 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-5

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	20	6	1	2	Subhedral; equant

GROUNDMASS: Fine grained. The groundmass contains plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	3	Rounded

COLOR: Medium light gray (N6).

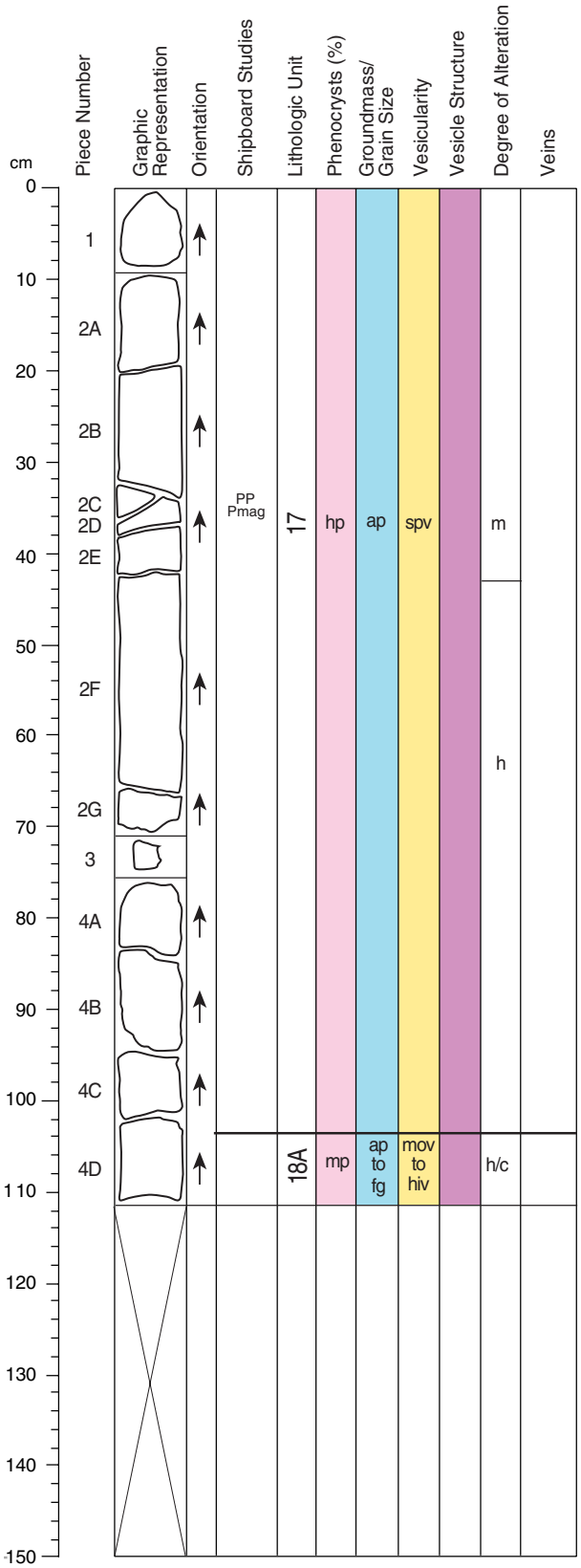
STRUCTURE: Massive.

ALTERATION: Moderate. Olivine phenocrysts are partially altered to Fe oxyhydroxide and clays along fractures and around crystal margins. Vesicles are filled with a soft white clay which expands when wet.

VEINS/FRACTURES: None. However, the rock is highly friable because of alteration of olivine phenocrysts, and the presence of clay-filled vesicles, and fractures easily in all directions.

COMMENTS: This is perhaps the least altered section of Unit 17, and contains many unaltered, or only partially altered olivine phenocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-40R-1 (Section top: 306.5 mbsf)

UNIT 17: HIGHLY OLIVINE-PHYRIC BASALT.

Pieces: 1-4C

CONTACTS: The contact between the brecciated base of Unit 17 and the red-brown soil of Unit 18A is in Piece 4D at 104 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	15-25	10	0.5	3	Euhedral to subhedral
Cr-Spinel	<1	0.5	0.1	0.2	Euhedral

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	1-2	1	Irregular

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

STRUCTURE: Massive (0-45 cm) and brecciated (45-112 cm).

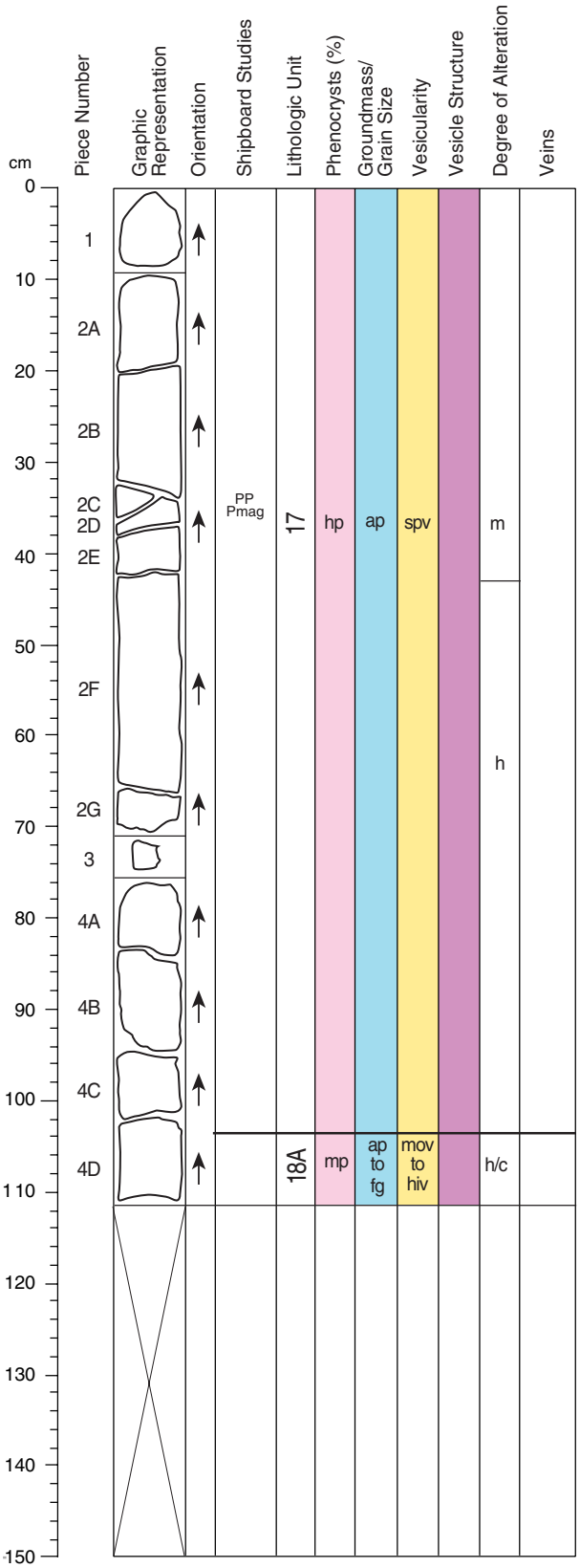
ALTERATION: Moderate to high. Olivine phenocrysts are partially altered to Fe-oxyhydroxide and clays along fractures and around crystal margins and may be altered to talc. Vesicles are filled with a soft white clay that expands when wet.

VEINS/FRACTURES: Sparsely veined. Veins are subhorizontal, <0.1-3 mm wide, and are filled with white carbonate and green clay.

COMMENTS: Cr-spinel is present as inclusions and discrete phenocrysts. Unaltered olivine is present in the center of some phenocrysts. The brecciated base (Pieces 2F to 4C) is cemented by white carbonate and pale green clay.

(Continued on next page.)

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-40R-1 (Continued)

UNIT 18A: RED-BROWN WEATHERED FLOW TOP WITH MODERATELY OLIVINE PHYRIC BASALT CLASTS.

Pieces: 4D

CONTACTS: The contact between the brecciated base of Unit 17 and the red-brown soil of Unit 18A is in Piece 4D at 104 cm.

PHENOCRYSTS:	%	Grain Size (mm)			
	Mode	Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1			Subhedral laths
Olivine:	2-4	2	0.2	0.8	Euhedral; equant

GROUNDMASS: Aphanitic to fine grained. The groundmass is highly to completely altered. Plagioclase laths are identifiable.

VESICLES:	%	Size (mm)	
	Mode	Avg.	Shape
	5-25	1	Round to irregular

COLOR: Moderate reddish brown (10R 4/6), very dusky red (10R 2/2).

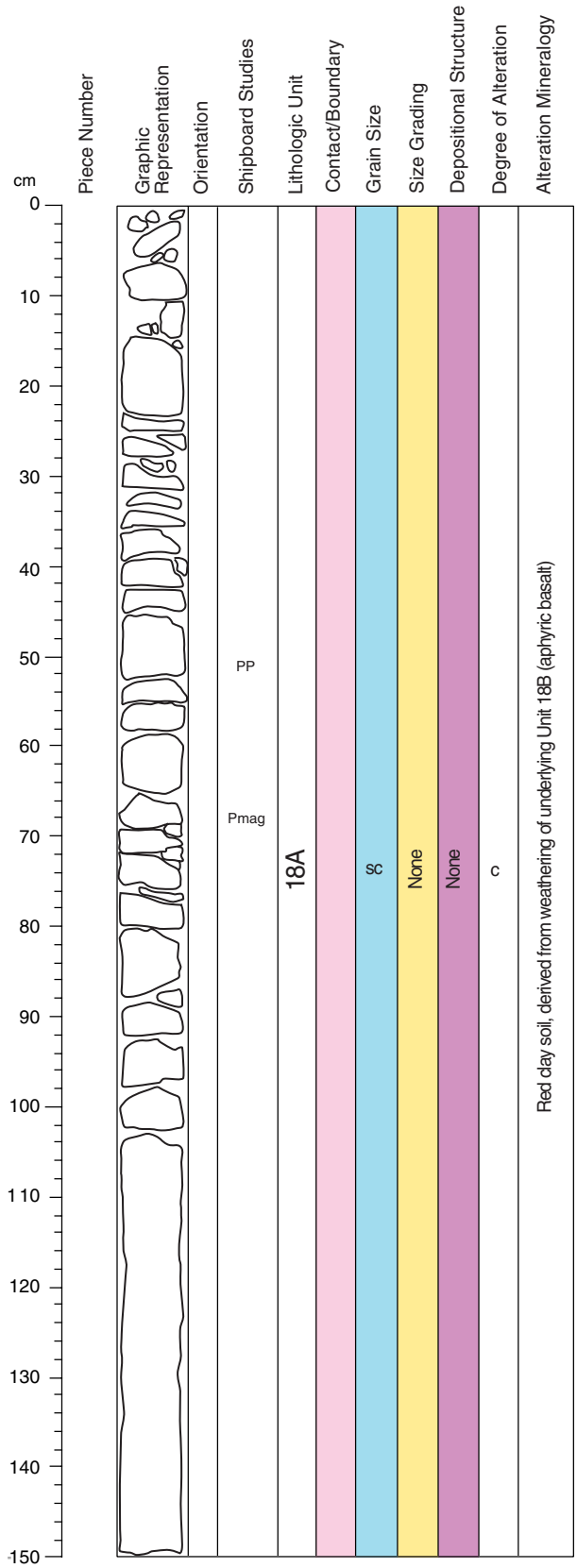
STRUCTURE: Brecciated.

ALTERATION: High to complete. Olivine phenocrysts are completely altered to Fe oxyhydroxide and yellowish green clay. Vesicles are filled with dark green clay, brown clay, or white carbonate.

VEINS/FRACTURES: None.

COMMENTS: The basalt clasts are similar to the basalt of Unit 18B. Subround clasts up to 4 cm are present in a matrix supported brecciocongloмerate. Clays form the cement.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-40R-2 (Section top: 307.61 mbsf)

UNIT 18A: RED-BROWN WEATHERED FLOW TOP WITH MODERATELY OLIVINE-PHYRIC BASALT CLASTS.

Pieces: Cut as sediment core.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1			1.5	Subhedral laths
Olivine:	3	2	0.2	0.5	Euhedral, equant

GROUNDMASS: Aphanitic to fine grained. The groundmass is highly to completely altered. Plagioclase laths are identifiable.

VESICLES:	% Mode	Size (mm): Average	Shape
	3-30	2	Irregular

COLOR: Dusky brown (5YR 2/2), dark reddish brown (10R 3/2 to 3/4), very dusky red (10R 2/2).

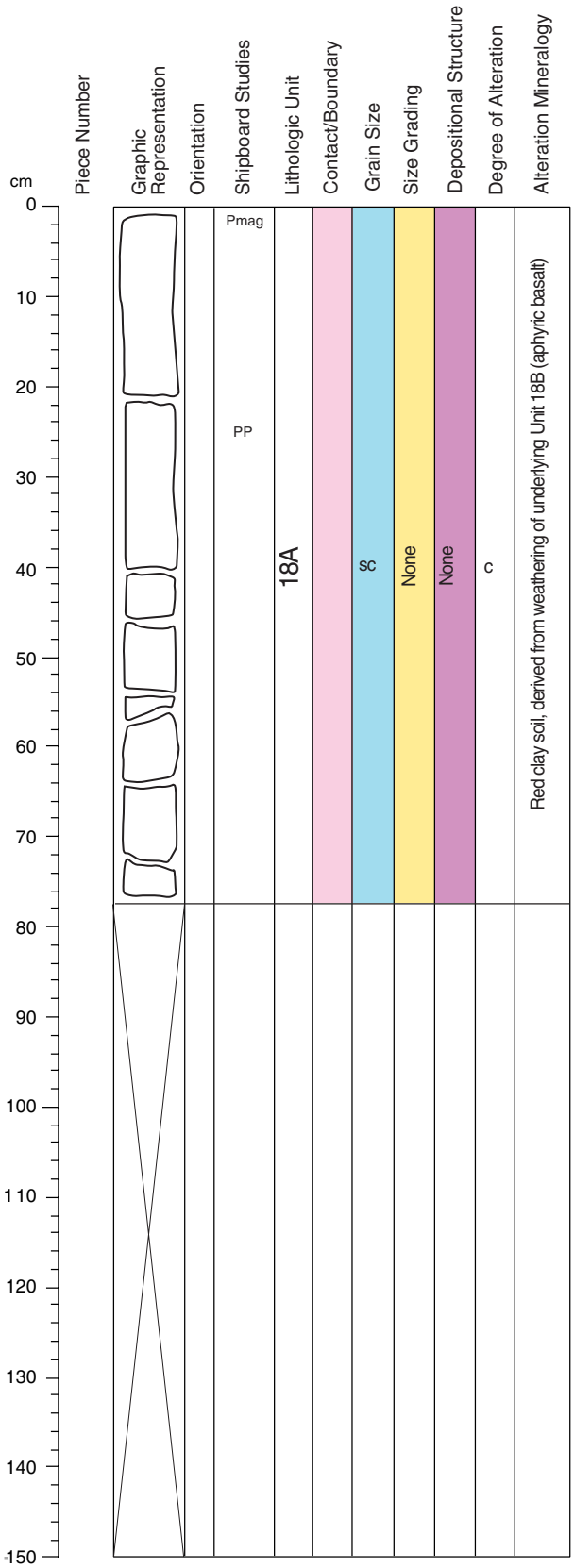
STRUCTURE: Vesicular.

ALTERATION: High to complete. Olivine phenocrysts are completely altered to Fe oxyhydroxide and yellowish green clay. Vesicles are filled with brown clay or white carbonate.

VEINS/FRACTURES: None.

COMMENTS: The entire section consists of a silty-clay red-brown soil that becomes progressively light in color upward. Contacts are gradational. At 19 cm the homogeneous soil structure is more disturbed and becomes darker and more enriched in cm-sized rounded pebbles downward (43-56 cm). Below 58 cm-depth bedding is slightly inclined as evidenced by two beds (at 82-85 cm, and at 87-92 cm) that contain mm to sub-cm clasts fining upward. Vertical veins filled by zeolite are present at 57-63 cm. Rounded to sub-rounded and sub angular 2-20 mm-sized clasts of basalt are present at 17-104 cm. The clasts are distinct from Unit 17 and represent the vesicular top of Unit 18B. In the interval 126-150 cm, round darker colored than the matrix 1-2 cm clay-clasts are dispersed in the very dusky red matrix.
This soil interval starts at Section 40R-1, 104 cm and continues in the first part of Section 40R-3 (0-77 cm) for a total length of 234 cm.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-40R-3 (Section top: 309.11 mbsf)

UNIT 18A: MODERATELY OLIVINE-PHYRIC BASALT.

Pieces: Archived as sediment, no piece numbers.

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	3	2	0.2	0.5	Euhedral, equant

GROUNDMASS: Aphanitic. The groundmass contains olivine (highly to completely altered), plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Highly vesicular	20-40	2	Irregular

COLOR: Medium gray (N5).

STRUCTURE: Vesicular.

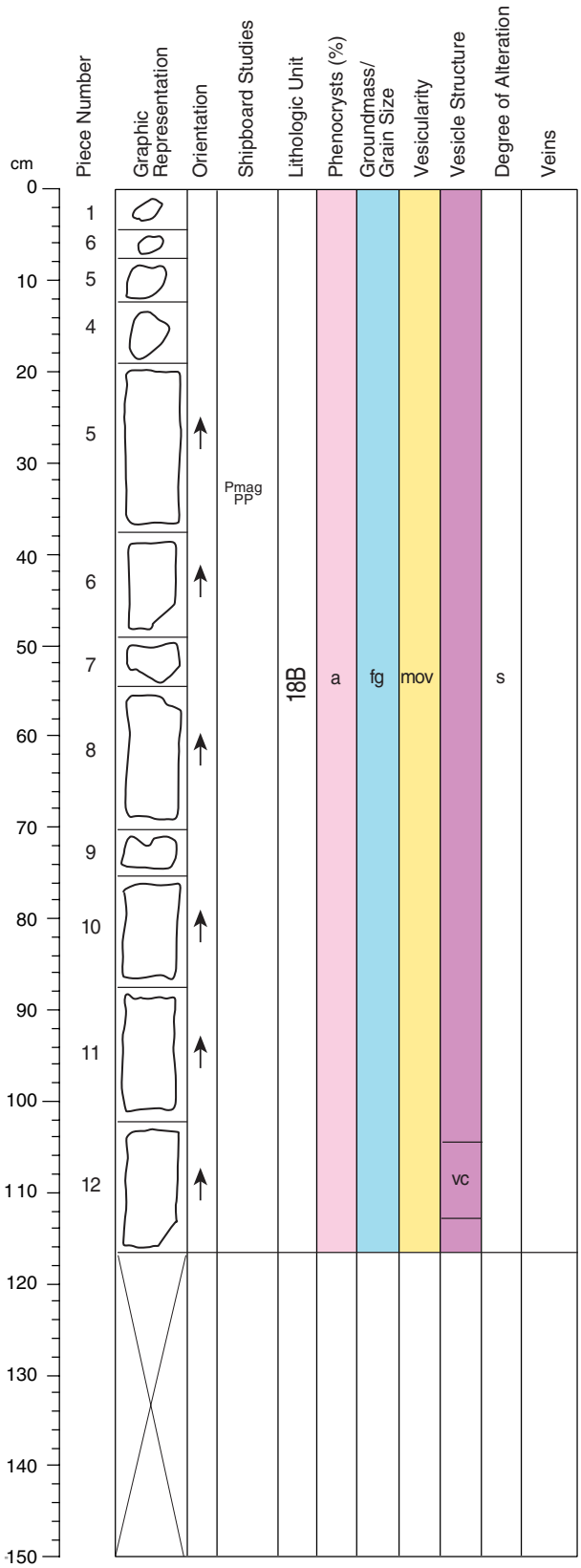
ALTERATION: High. Olivine phenocrysts are highly to completely altered to Fe oxyhydroxide and yellowish green clay. Vesicles are filled with brown clay or lined with bluish gray clay.

VEINS/FRACTURES: None.

COMMENTS: Olivine is present in a continuous size range from phenocryst to barely larger than the aphanitic groundmass.

At 0-77 cm a brown soil bed is present. It consists of a firm very dark brown (10YR 2/2) silty-clay materials. At 55-77 cm, sub angular cm to dm-sized, very oxidized-coated clasts of lava are embedded in the soil matrix, and cm-size vesicles coated with gray crust (silagonite) occur at the rock/soil interface. At 33-39 cm sub-cm to mm vertical cracks are filled with zeolite. A few lighter colored mm-sizes rounded particles of silt are dispersed in the brown matrix at 0-35 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-40R-4 (Section top: 309.88 mbsf)

UNIT 18B: APHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

GROUNDMASS: Fine grained. The groundmass contains olivine (altered), plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	5-15	3	Subround

COLOR: Medium gray (N5).

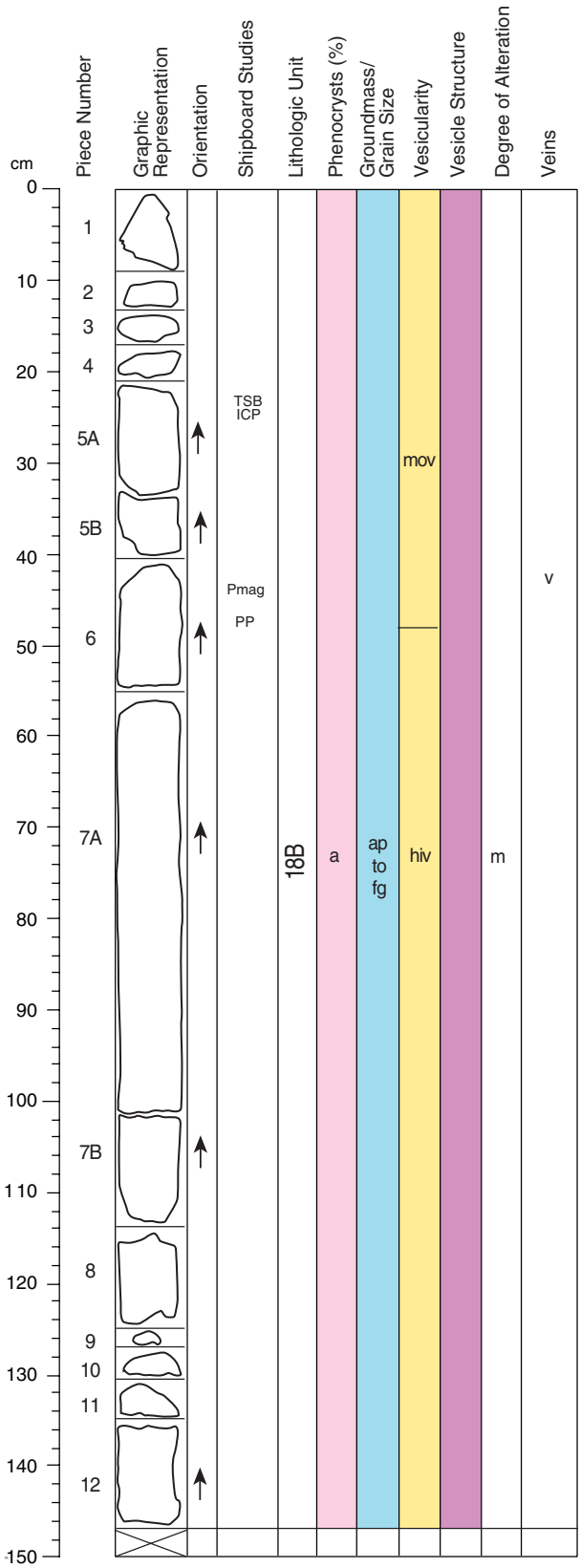
STRUCTURE: Vesicular.

ALTERATION: Slight. Groundmass olivine is completely altered to Fe oxyhydroxide and light yellowish green clay. Groundmass mesostasis is moderately altered to dark gray clay. Vesicles are lined with greenish gray clay, and a colorless zeolite.

VEINS/FRACTURES: None.

COMMENTS: Vesicles decrease in abundance and increase in size down section. Throughout the section there is a second generation of very small (<0.5 mm) vesicles with irregular shapes. An irregular, diagonal segregation vein is present in Piece 12 at 105-113 cm.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-41R-1 (Section top: 311.1 mbsf)

UNIT 18B: APHYRIC BASALT.

Pieces: 1-12

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1	0.2	0.3	Euhedral, elongate
Olivine:	<1	3	0.2	0.5	Euhedral, equant

GROUNDMASS: Fine grained to aphanitic. Grain size decreases down section. The groundmass contains olivine (altered), plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
0-50 cm	2	2	Round
50-147 cm	15-20	3	Round

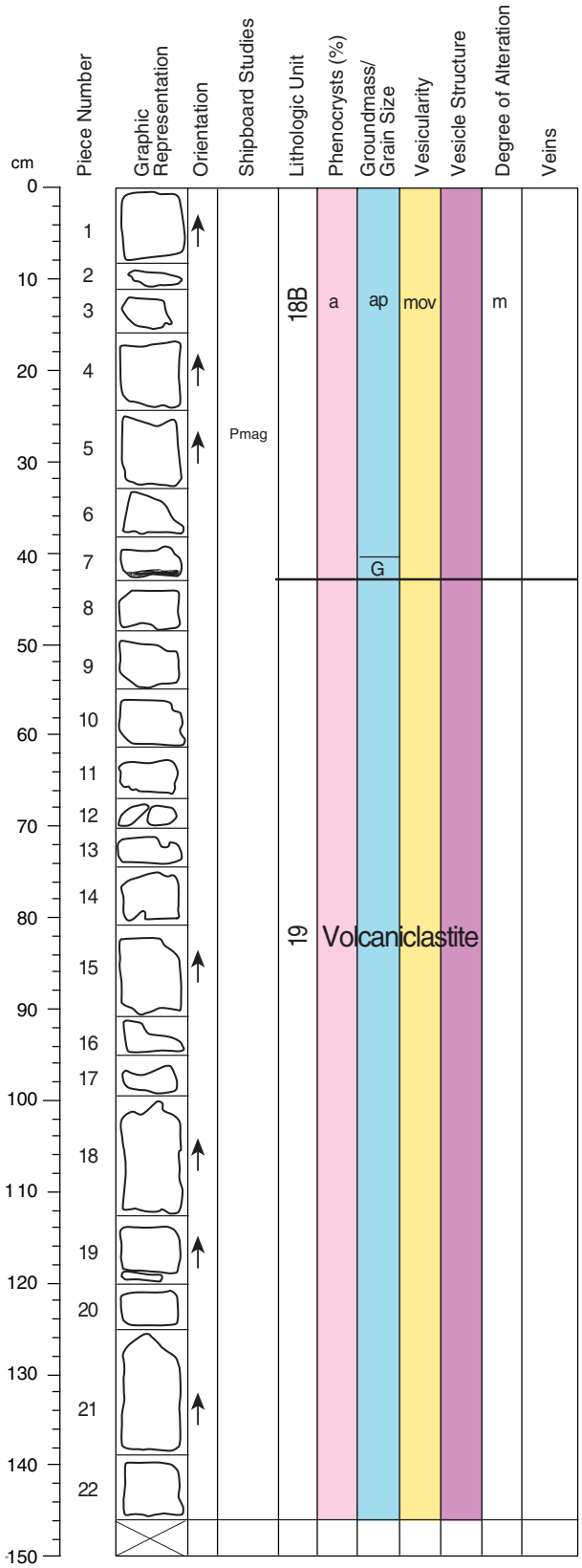
COLOR: Light gray (N7).

STRUCTURE: Vesicular.

ALTERATION: Moderate. Olivine is completely altered to Fe oxyhydroxide and light yellowish greenish gray clay. Groundmass mesostasis is altered to dark gray clay. Vesicles are lined with greenish gray, bluish gray, and dark gray clay, and rare carbonate and Fe oxyhydroxide.

VEINS/FRACTURES: None, but a few pieces have traces of Fe oxyhydroxide and carbonate on some exterior surfaces that may have been vein filling.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-41R-2 (Section top: 312.57 mbsf)

UNIT 18B: APHYRIC BASALT.

Pieces: 1-7

CONTACTS: Sharp horizontal contact with the underlying breccia of Unit 19 is in Piece 7 at 42 cm.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Plagioclase:	<<1	1	0.2	0.3	Euhedral, elongate
Olivine:	<1	2	0.2	0.5	Euhedral, equant

GROUNDMASS: Aphanitic. The groundmass contains olivine (altered), plagioclase, pyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	15	3	Irregular

COLOR: Light gray (N7).

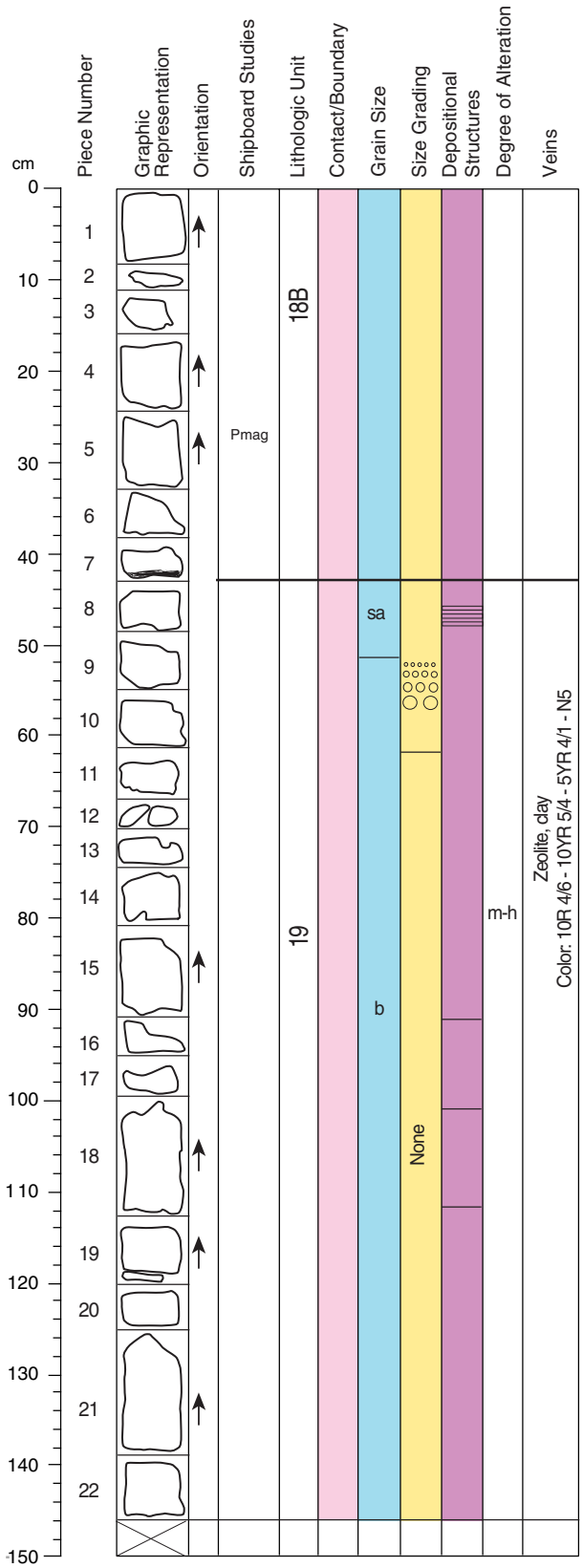
STRUCTURE: Vesicular.

ALTERATION: Moderate. Olivine is completely altered to Fe oxyhydroxide and light yellowish greenish gray and greenish gray clay. Groundmass mesostasis is altered to dark gray clay. Vesicles are lined with greenish gray, bluish gray, and dark gray clay, and rare carbonate and Fe oxyhydroxide.

VEINS/FRACTURES: None, but Piece 2 (which may be a dropstone) has several <0.5 mm wide veins and some brown clay attached.

COMMENTS: Piece 7 contains glass.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-41R-2 (Section top: 312.57 mbsf)

UNIT 19: VOLCANICLASTIC BASALT BRECCIA.

Pieces: 7-22

CONTACTS: The contact between Units 18B (basalt) and 19 is at 42 cm in Piece 7.

GENERAL DESCRIPTION: Clast to matrix supported volcaniclastic basalt breccia.

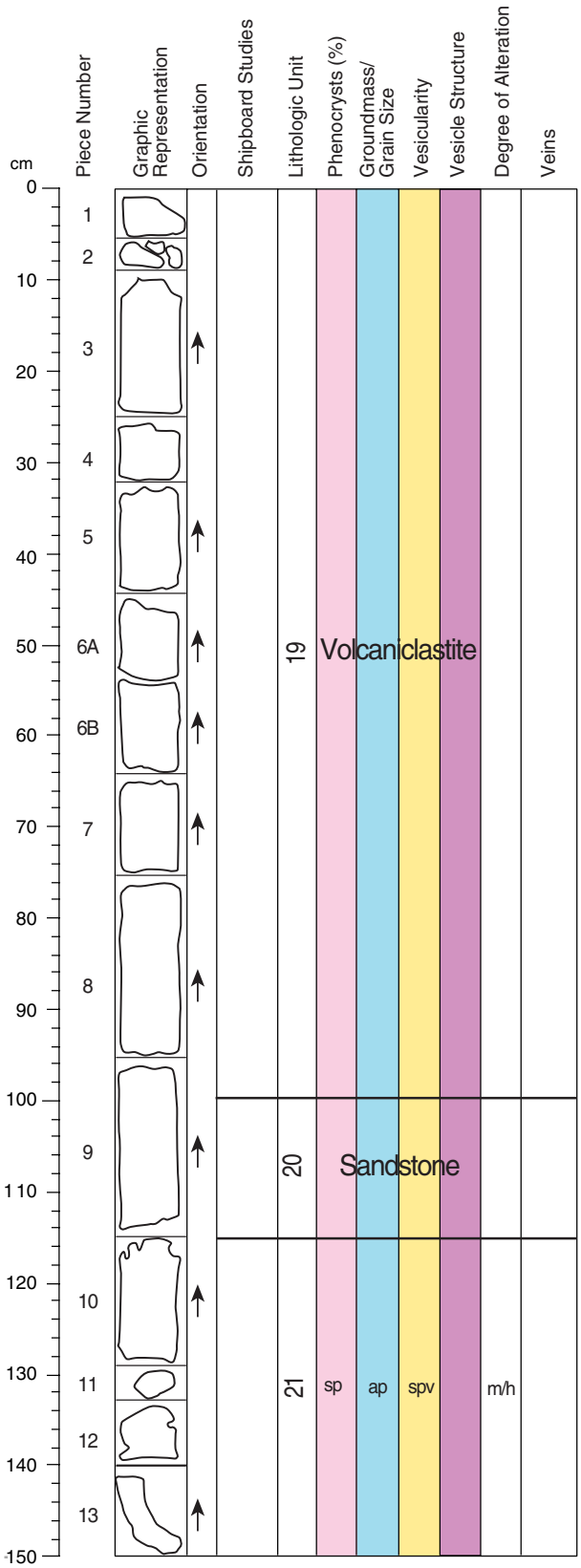
COLOR: Multicolored, reflecting different degrees of alteration in the basalt clasts. Moderate reddish brown (10R 4/6), light bluish gray (5B 7/1), medium light gray (N6), and dark gray (N3).

COMPONENTS: Subangular to subround clasts of sparsely to highly vesicular basalt. Vesicles are irregular in shape and filled with pale bluish green clay and zeolite. Gravel sized basalt clasts (<5 cm) in a sand sized matrix of basalt fragments. The dominant basalt type is aphanitic and sparsely olivine-plagioclase-phyric of similar lithology to the basalt in Unit 21. In Piece 21 and below, highly olivine-phyric basalt clasts are present (≤3 cm). Olivine is altered to pale bluish green clay. Scoriaceous material is present in Piece 20. The cement is a mixture of clay and zeolite.

SEDIMENTARY TEXTURES: Poorly sorted, but with a finer, sand-dominated lithology at the top of the unit (42-52 cm). Gravel sized clasts in a sand sized matrix.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-41R-3 (Section top: 314.04 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-7

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	2	0.5	1	Subhedral; equant
Plagioclase:	~1	1.5	0.5	1	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	0.5	Irregular

COLOR: Medium dark gray (N4). Matrix is greenish black (5GY 2/1).

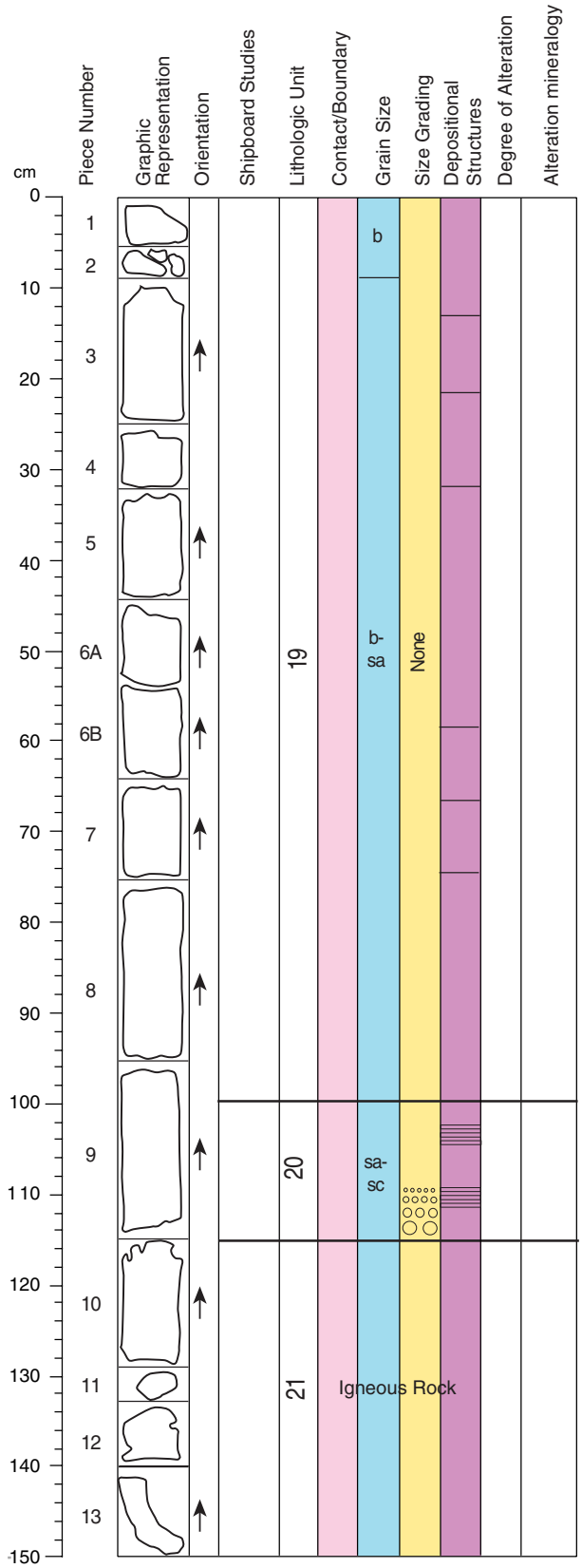
STRUCTURE: Brecciated.

ALTERATION: Moderate to high. Olivine phenocrysts are partially altered to gray-green clay. Vesicles and cavities are lined with blue-green clay.

VEINS/FRACTURES: None.

COMMENTS: Section 41R-4 is interpreted to be the brecciated flow top of Unit 21, and is composed of angular clasts of basalt up to 50 mm in size. Cavities between the clasts are partially filled with a dark green silty sandstone material similar to that which makes up Unit 20 in Section 41R-3.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-41R-3 (Section top: 314.04 mbsf)

UNIT 19: VOLCANICLASTIC BASALT BRECCIA.

Pieces: 1-9

CONTACTS: The contact between Units 19 and 20 (sandstone) is at 98 cm in Piece 9.

GENERAL DESCRIPTION: Clast supported volcaniclastic basalt breccia.

COLOR: Multicolored, reflecting different degrees of alteration in the basalt clasts. Moderate reddish brown (10R 4/6), moderate yellowish brown (10YR 5/4), brownish gray (5YR 4/1), and medium gray (N5).

COMPONENTS: Subangular to subround clasts of sparsely to highly vesicular basalt. Some clasts are scoriaceous. Vesicles are irregular in shape and filled with pale bluish green clay and zeolite. Gravel sized basalt clasts (<4 cm) in a sand sized matrix of basalt fragments. The dominant basalt type is aphanitic and sparsely olivine-plagioclase-phyric of similar lithology to the basalt in Unit 21. Highly olivine-phyric basalt clasts are present (≤2.5 cm). Olivine is altered to pale bluish green clay. The cement is a mixture of clay and zeolite.

SEDIMENTARY TEXTURES: Poorly sorted. Gravel sized clasts in a sand sized matrix.

UNIT 20: LITHIC SANDSTONE.

Pieces: 9

CONTACTS: Sharp contact between Units 19 and 20 at 98 cm. Contact between Units 20 and 21 is inferred to be between Pieces 9 and 10. A sandstone of the same lithology fills fractures in the brecciated flow top of Unit 21.

GENERAL DESCRIPTION: Clast-supported volcaniclastic sandstone.

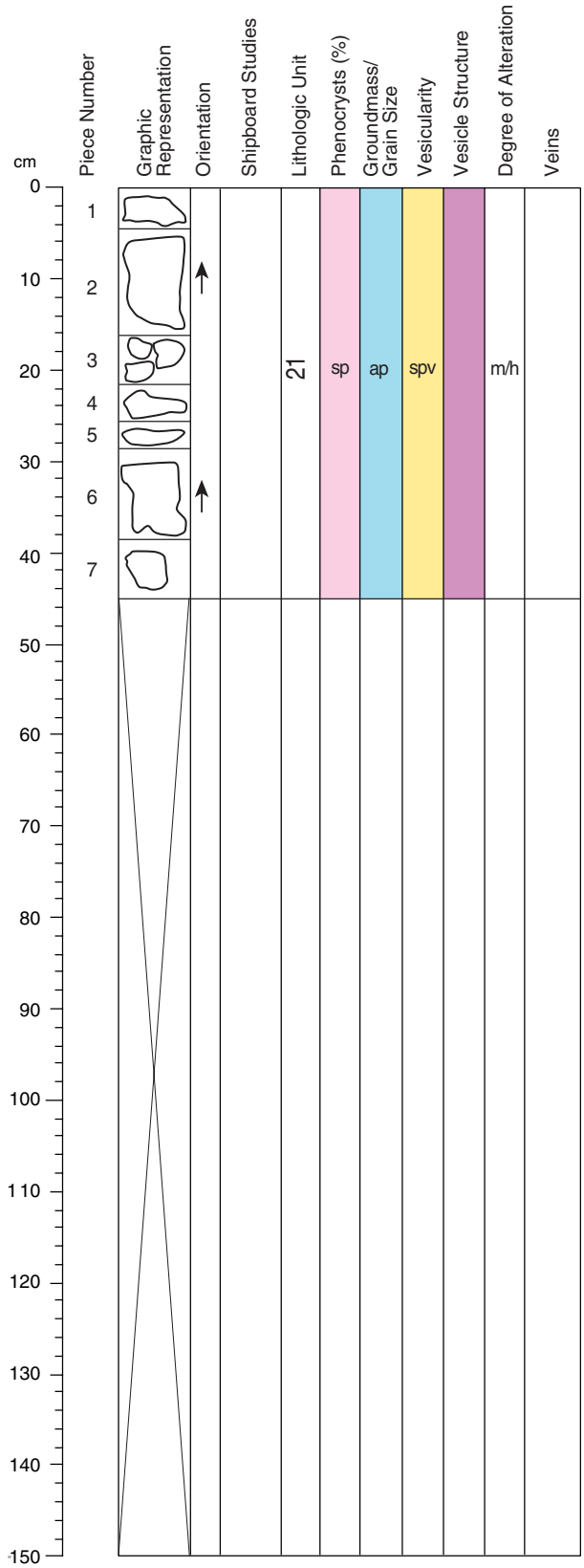
COLOR: Pale olive gray (5Y 5/2).

COMPONENTS: Subround to round, 0.5-5 mm clasts of basaltic glass, vesicular aphyric or olivine-plagioclase-phyric basalt.

SEDIMENTARY TEXTURES: Poorly sorted. Clast supported. Grain size 0.5-4 mm.

SEDIMENTARY STRUCTURES: Massive.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-41R-4 (Section top: 315.54 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-7

CONTACTS: None.

PHENOCRYSTS:

	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1	2	0.5	1	Subhedral; equant
Plagioclase:	~1	1.5	0.5	1	Subhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene and black oxides.

VESICLES:

	% Mode	Size (mm): Average	Shape
Sparsely vesicular	3	0.5	Irregular

COLOR: Medium dark gray (N4). Matrix is greenish black (5GY 2/1).

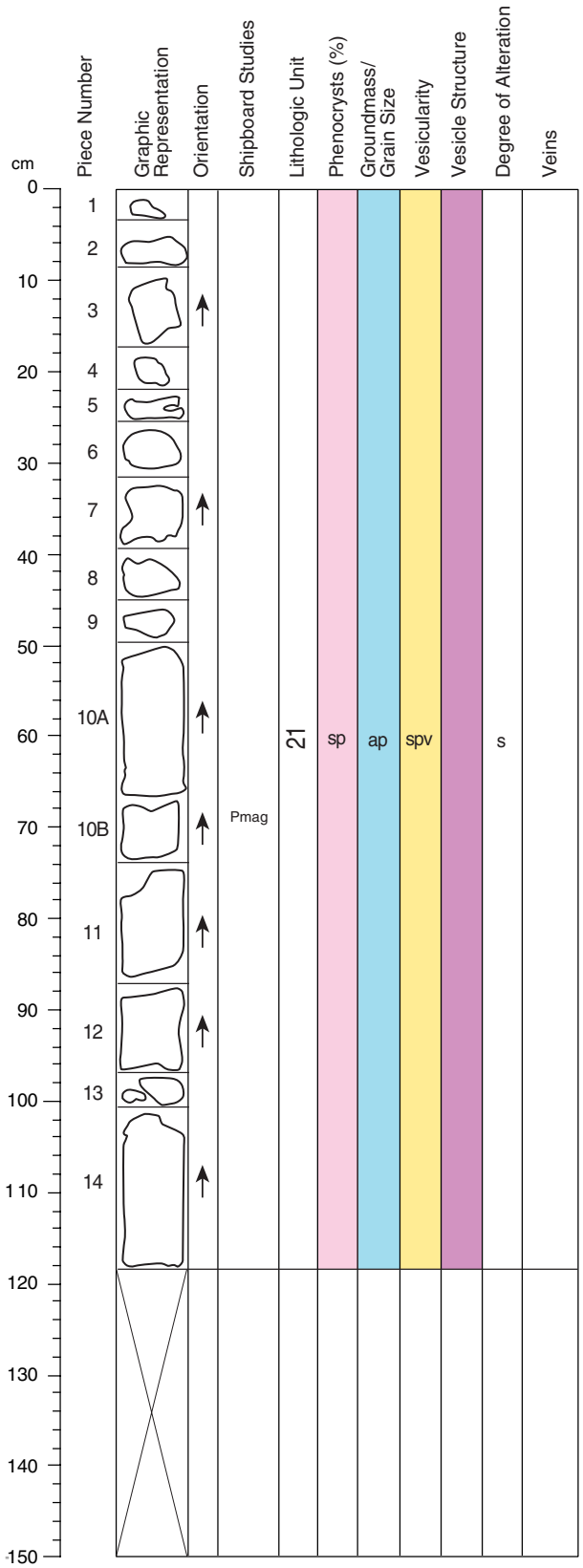
STRUCTURE: Brecciated.

ALTERATION: Moderate to high. Olivine phenocrysts are partially altered to gray-green clay. Vesicles and cavities are lined with blue-green clay.

VEINS/FRACTURES: None.

COMMENTS: Section 41R-4 is interpreted to be the brecciated flow top of Unit 21, and is composed of angular clasts of basalt up to 50 mm in size. Cavities between the clasts are partially filled with a dark green silty sandstone material similar to that which makes up Unit 20 in Section 41R-3.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-42R-1 (Section top: 316.1 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-14

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	1	0.5	0.75	Euhedral; equant
Plagioclase:	<1	1	0.5	0.75	Euhedral; elongate

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	2	0.5	Irregular

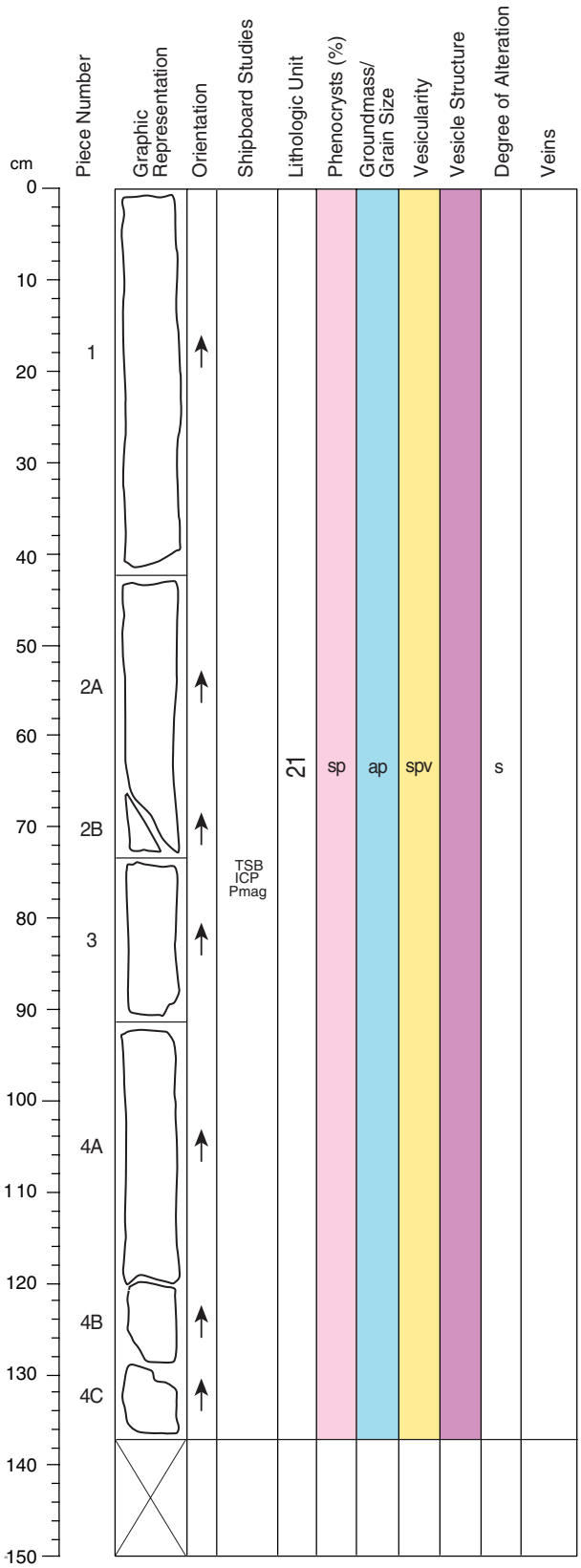
COLOR: Dark gray (N3).

STRUCTURE: Breccia. Section consists of brecciated lava flow top (2-20 mm irregular clasts that are progressively agglutinated with depth).

ALTERATION: Slight. Olivine phenocrysts are slightly to highly altered to light yellowish white clay. Vesicles are lined with brownish gray clay and phillipsite.

VEINS/FRACTURES: None.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-42R-2 (Section top: 317.27 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-4

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	2	0.5	1.5	Euhedral; equant
Plagioclase:	<1	4	0.5	1.5	Euhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	2	0.5	Irregular

COLOR: Light gray (N7).

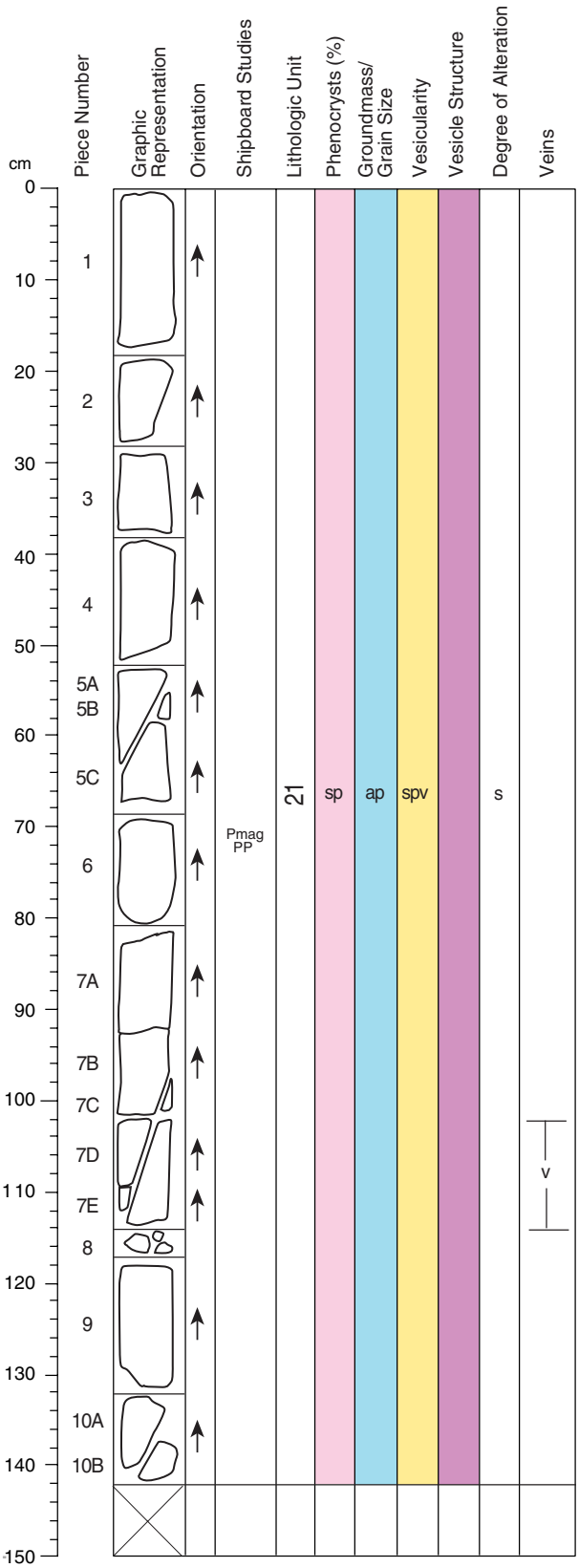
STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are slightly to highly altered to light yellowish white clay. Vesicles are lined with brownish gray clay.

VEINS/FRACTURES: Sparsely fractured. A few randomly oriented fractures are present, and some are lined with grayish green clay.

COMMENTS: Olivine abundance increases slightly down section. Some of the phenocrysts occur as glomerocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-42R-3 (Section top: 318.64 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-10

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	1	0.5	0.75	Euhedral; equant
Plagioclase:	<1	1	0.5	0.75	Euhedral; elongate

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	2	0.5	Irregular

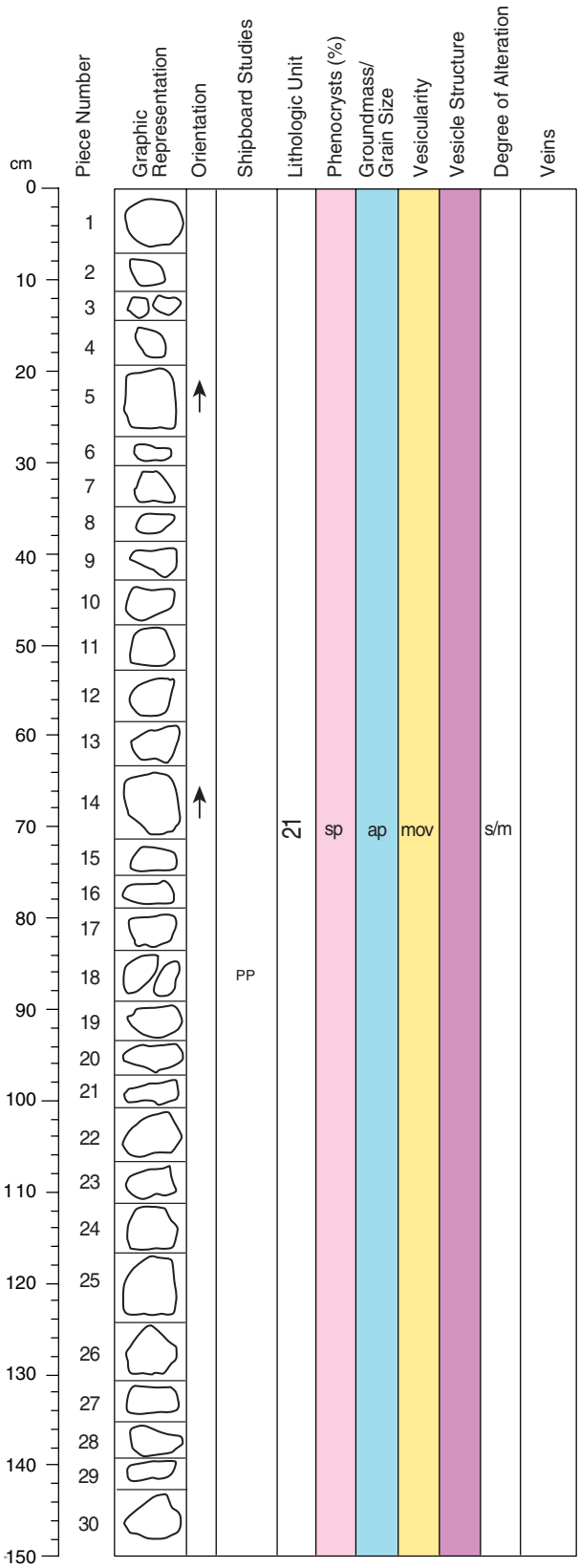
COLOR: Dark gray (N3).

STRUCTURE: Massive.

ALTERATION: Slight. Olivine phenocrysts are slightly to highly altered to light yellowish white clay. Vesicles are lined with brownish gray clay and phillipsite. A blue alteration hue is present in Piece 2.

VEINS/FRACTURES: Sparsely fractured. A few randomly oriented fractures are present in Piece 9, and are filled with grayish green clay.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-43R-1 (Section top: 320.6 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-30

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	1-2	2	0.5	1	Subhedral; equant
Plagioclase:	1	2.5	0.5	1.5	Euhedral; prismatic

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	7	2	Irregular

COLOR: Medium light gray (N6).

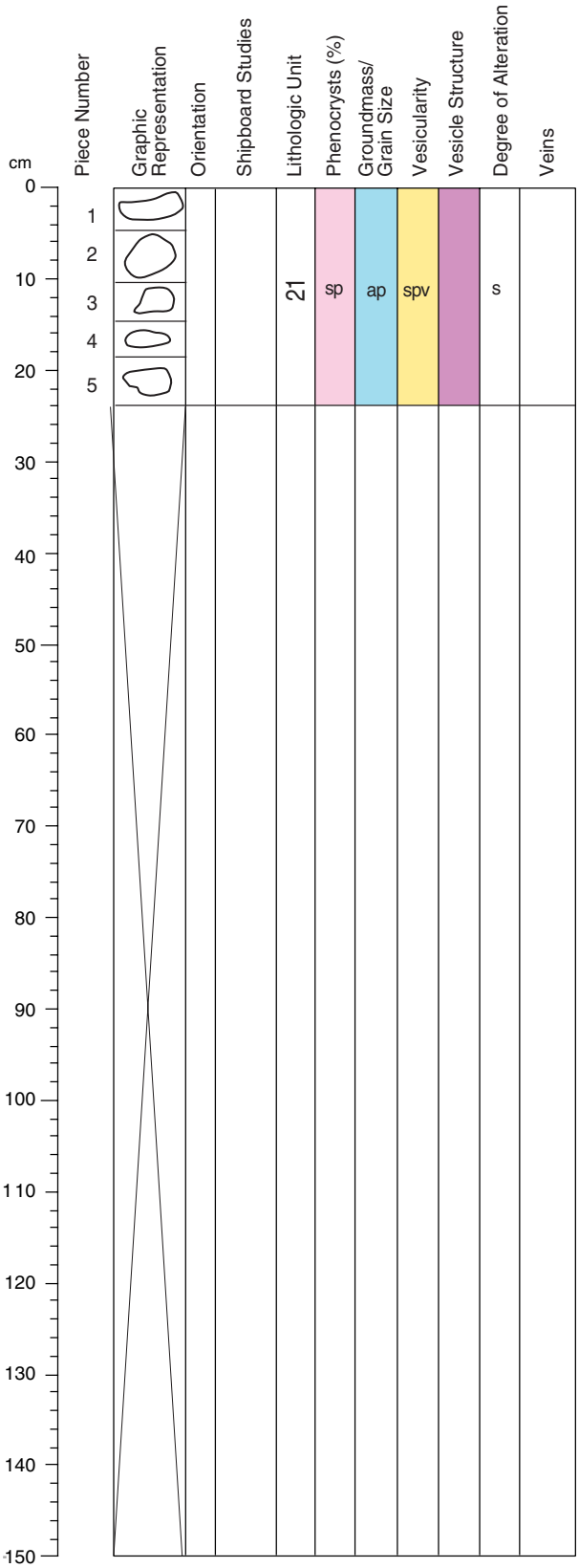
STRUCTURE: Vesicular.

ALTERATION: Slight to moderate. Olivine phenocrysts are partially altered to Fe oxyhydroxide and clay minerals. Vesicles are lined with blue-gray clay and colorless zeolite.

VEINS/FRACTURES: Sparsely fractured. Randomly oriented fractures, <0.5 mm wide, are lined with zeolite and blue-green clay.

COMMENTS: Olivine and plagioclase phenocrysts often occur together in glomerocrysts.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-43R-2 (Section top: 322.1 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-5

CONTACTS: None.

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

GROUNDMASS: Aphanitic. The groundmass contains plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Sparsely vesicular	5	2	Elongate

COLOR: Light gray (N7).

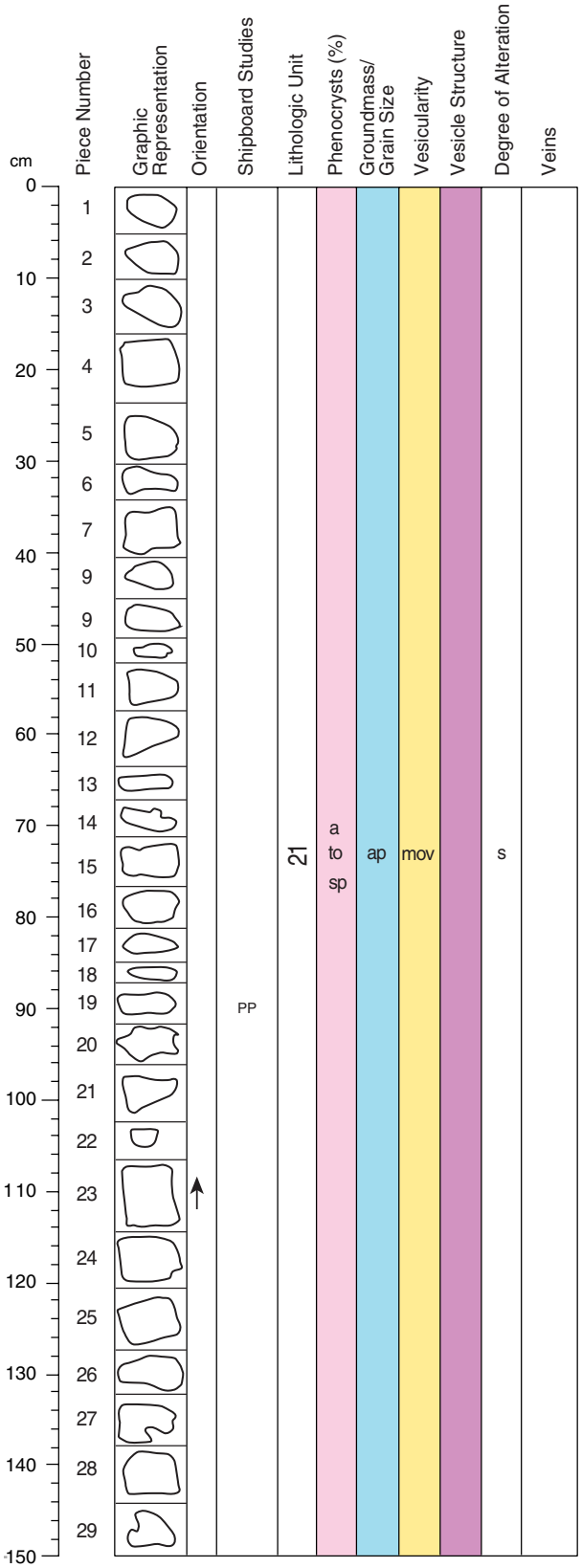
STRUCTURE: Vesicular.

ALTERATION: Slight. Olivine phenocrysts are slightly to completely altered to yellow green clay or Fe oxyhydroxide. Groundmass mesostasis is slightly altered to dark gray clay. Some vesicles are lined with a few small clear or yellow crystals.

VEINS/FRACTURES: None.

COMMENTS: Some phenocrysts occur as glomerocrysts. Prominent black oxides in a light gray groundmass give this rock a speckled appearance under the binocular microscope.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-44R-1 (Section top: 323.2 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-29

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1	0.5	0.75	Euhedral, equant
Plagioclase:	<1	1	0.5	0.75	Euhedral, elongate

GROUNDMASS: Aphanitic. The groundmass contains abundant plagioclase, clinopyroxene, black oxides and altered mesostasis.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	8	1	Round to elongate

COLOR: Light gray (N7).

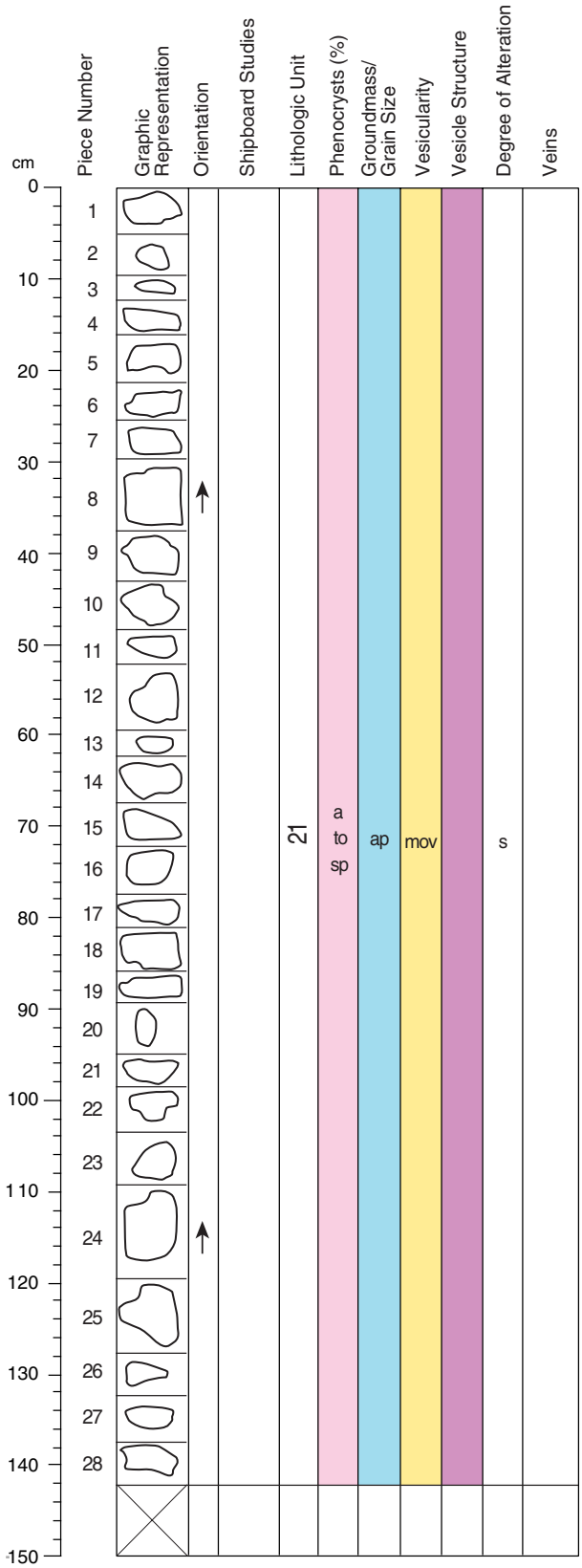
STRUCTURE: Massive. A faint flow foliation is present throughout, defined by mm-wide sub parallel wisps of darker material and an elongation of rare vesicles along these planes.

ALTERATION: Slight. Olivine phenocrysts are slightly to completely altered to yellow green clay or Fe-oxyhydroxide. Groundmass mesostasis is slightly altered to dark gray clay. Some vesicles are lined with gray clay. Matrix breccia altered to dark brown clay.

VEINS/FRACTURES: None.

COMMENTS: Prominent black oxides in a light gray groundmass give this rock a speckled appearance under the binocular microscope. Piece 1 is a rounded cobble of vesicular basalt and probably represents a dropstone.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-44R-2 (Section top: 324.7 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-28

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	<1	1	0.5	0.75	Euhedral, equant
Plagioclase:	<1	1	0.5	0.75	Euhedral, elongate

GROUNDMASS: Aphanitic. The groundmass contains abundant plagioclase, clinopyroxene, black oxides and altered mesostasis. Pyrite is present as a 0.5 mm bleb in Piece 24.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	8	1	Round to elongate

COLOR: Light gray (N7).

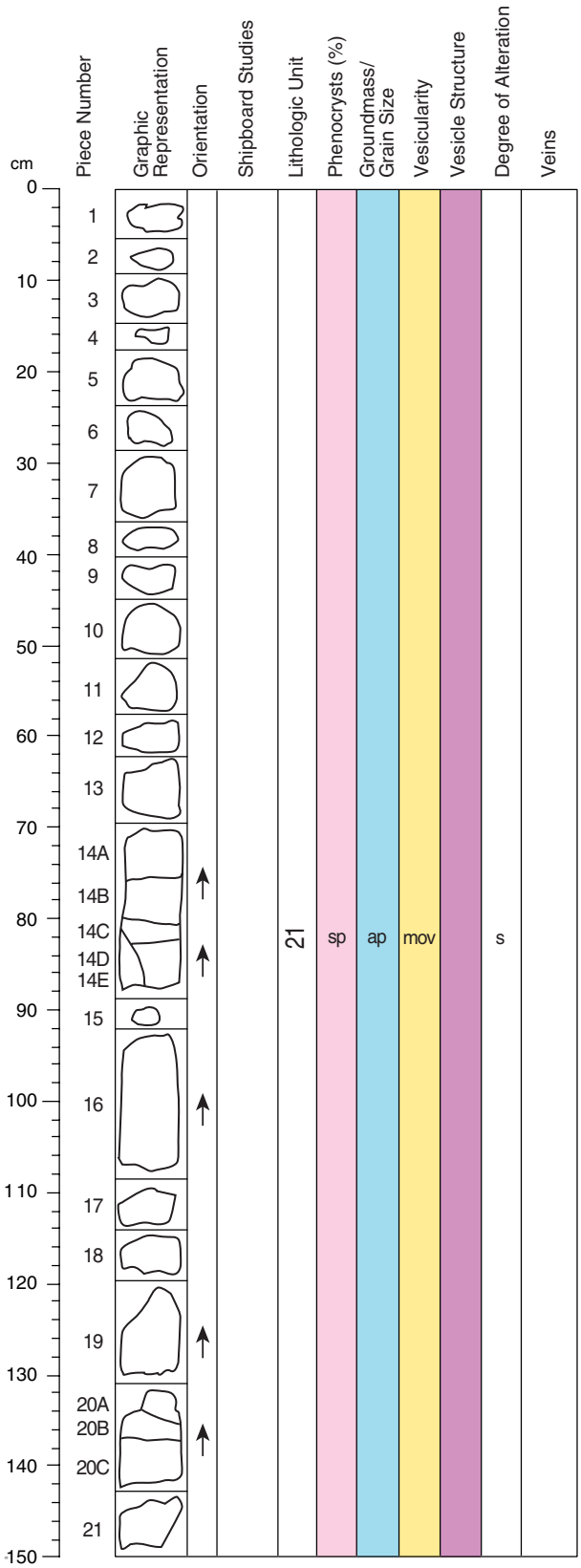
STRUCTURE: Massive. A faint flow foliation is present throughout, defined by mm-wide sub parallel wisps of darker material and an elongation of rare vesicles along these planes.

ALTERATION: Slight. Olivine phenocrysts are slightly to completely altered to yellow green clay or Fe oxyhydroxide. Groundmass mesostasis is slightly altered to dark gray clay. Some vesicles are lined with gray clay.

VEINS/FRACTURES: None.

COMMENTS: Prominent black oxides in a light gray groundmass give this rock a speckled appearance under binocular microscope.

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-45R-1 (Section top: 329.5 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-21

CONTACTS: None.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	~1	1	0.5	0.75	Euhedral; equant
Plagioclase:	1-2	1	0.5	0.75	Euhedral; tabular; elongate

GROUNDMASS: Aphanitic. The groundmass contains abundant plagioclase, clinopyroxene and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
Moderately vesicular	8	4	Elongate

COLOR: Light gray (N7).

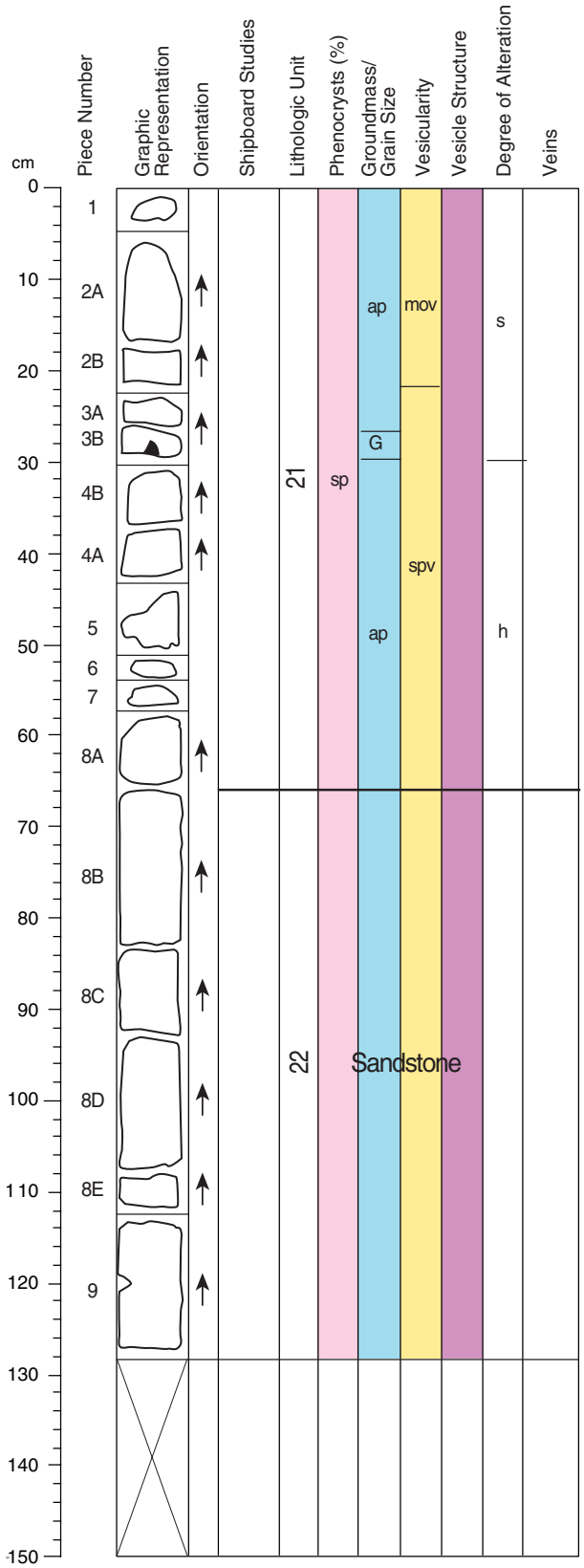
STRUCTURE: Massive. A flow fabric is present as aligned elongate vesicles between 0-50 cm, and as parallel wispy flow bands between 50-88 cm.

ALTERATION: Very slight. Olivine phenocrysts are sometimes replaced by light green clay. Mild penetrative alteration of the groundmass occurs along flow bands. Euhedral pyrite is dispersed throughout.

VEINS/FRACTURES: None.

COMMENTS: Unaltered olivine and scattered glomerocrysts of olivine and plagioclase are present.
0-90 cm: Massive lava with distinct flow fabric.
90-139 cm: Breccia; 4-70 mm angular massive lava clasts, bounded by fracture surfaces of highly angular, blocky and splinter-like glassy fragments.
139-150 cm: Massive lava.
All intervals consist of identical lithology; blocky and splinter-like clasts in the breccia matrix indicate origin by quenched fragmentation (i.e., lava flowing into water).

Core Photo



IGNEOUS ROCK VISUAL CORE DESCRIPTION

197-1206A-45R-2 (Section top: 331.0 mbsf)

UNIT 21: SPARSELY OLIVINE-PLAGIOCLASE-PHYRIC BASALT.

Pieces: 1-8B.

CONTACTS: Conformable contact between Units 21 and 22 is at 68 cm (Piece 8B). It is a horizontal depositional contact.

PHENOCRYSTS:	% Mode	Grain Size (mm): Max.	Min.	Avg.	Shape/Habit
Olivine:	~1	1	0.5	0.75	Euhedral; equant
Plagioclase:	1-2	1	0.5	0.75	Euhedral; tabular; elongate

GROUNDMASS: Aphanitic. The groundmass contains abundant plagioclase, clinopyroxene and black oxides.

VESICLES:	% Mode	Size (mm): Average	Shape
	4-8	4	Elongate

COLOR: Light gray (N7).

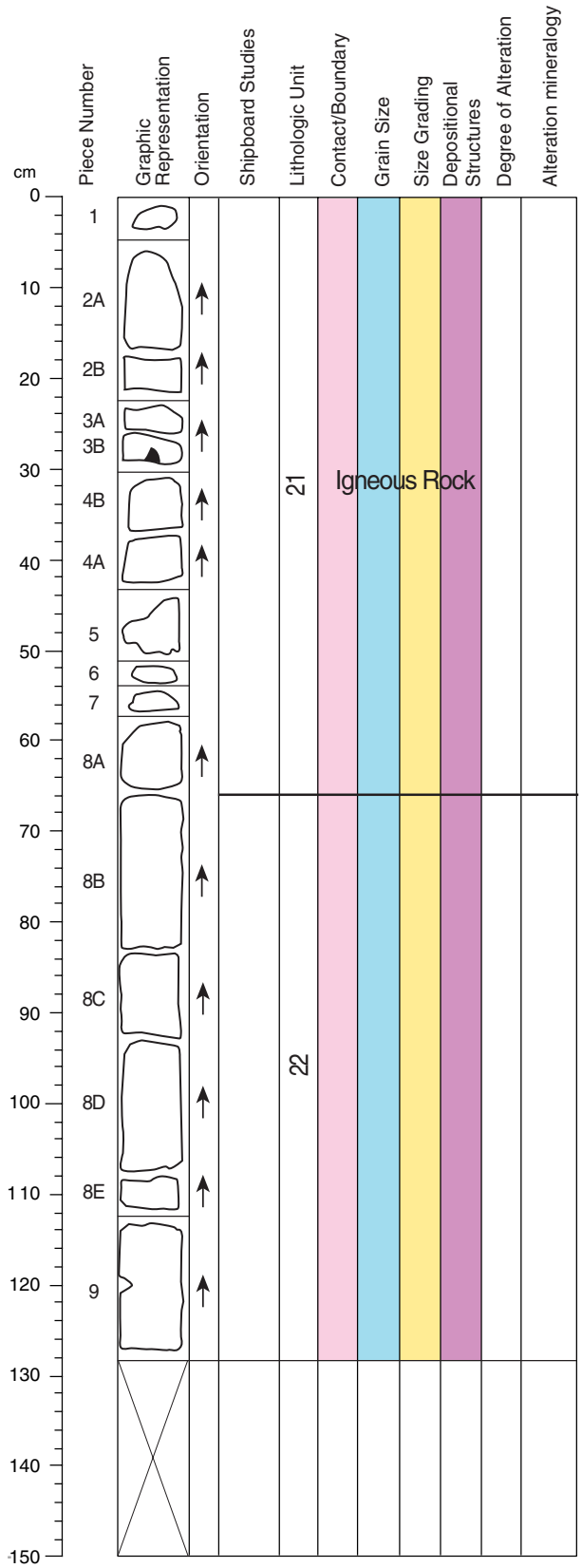
STRUCTURE: Massive. A flow fabric is present as aligned elongate vesicles between 0-50 cm, and as parallel wispy flow bands between 50-88 cm.

ALTERATION: Slight to high. Olivine phenocrysts are sometimes replaced by light green clay. Mild penetrative alteration of the groundmass occurs along flow bands. Euhedral pyrite is dispersed throughout. Matrix in breccia altered to green clay.

VEINS/FRACTURES: None.

COMMENTS: Unaltered olivine and scattered glomerocrysts of olivine and plagioclase are present.
0-27 cm: Massive lava. Continuation from 45R-1 (Pieces 20-21). Sharp jagged lobe margins at 27 cm. This interval most likely represents a lava finger protruding down into the flow base breccia.
27-68 cm: Flow base breccia, consisting of 2-50 mm massive, angular lava clasts in a highly altered ash-size matrix.

Core Photo



VOLCANICLASTIC ROCK VISUAL CORE DESCRIPTION

197-1206A-45R-2 (Section top: 331.0 mbsf)

UNIT 22: LITHIC VITRIC SANDSTONE.

Pieces: 8B-9

CONTACTS: At 68 cm, Piece 8B: boundary Unit 21/22

GENERAL DESCRIPTION: This core interval consists of dark gray (5Y 4/1) to very dark green (4/10 BG), medium to coarse sandstone 68-94 cm; a few laminae 94-96 cm before turning into a reddish black moderately sorted very coarse sandstone with pebbles the rest of the section.

COLOR: 68-94 cm: dark greenish gray (5/5BG) to very dark greenish gray (4/10BG)
94-96 cm: light gray (2.5Y 7/2); 96-128 cm: black to reddish black (5YR 2.5/1).

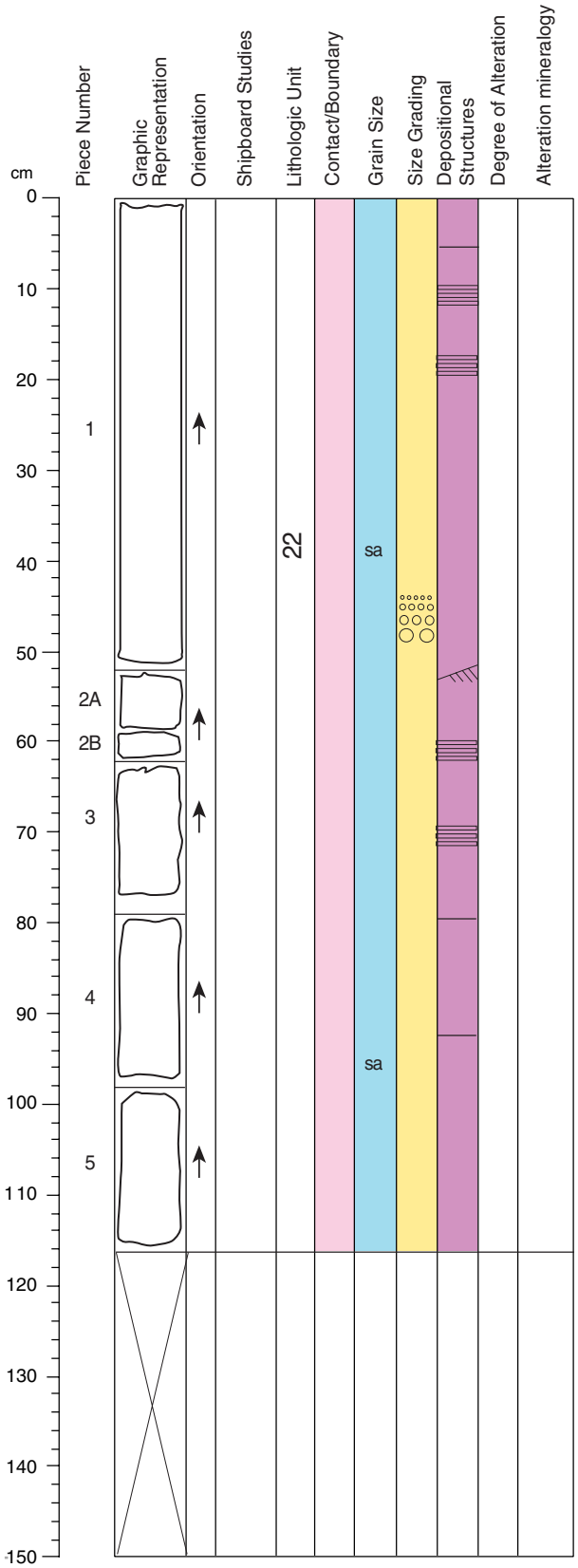
COMPONENTS:
68-94 cm: 15% calcite, 15% clay, 20% basalt fragments, 30% volcanic glass, 10%crystals (olivine, plagioclase).
94-96 cm: 50% calcite, 20% basalt fragments, 20% volcanic glass (mostly altered).
94-128 cm: 10-20% clay, 5-10% shell debris 30-40% basalt fragments, 20-30% volcanic glass (mostly altered).

SEDIMENTARY TEXTURES:
68-94 cm: Fine to medium sandstone, moderately well sorted.
94-96 cm: Fine sandstone, well sorted.
96-128 cm: Medium to coarse sandstone with pebbles, moderately well sorted.

SEDIMENTARY STRUCTURES:
68-94 cm: Finely laminated sandstone; graded bedding.
94-96 cm: Clearly distinctly laminated sandstone.
96-128 cm: Weakly laminated sandstone.

COMMENTS: This is a near shore environment where high energy have been sustained with calmer periods giving finer lamination. An interval with pebbles and large (1-2 cm) clasts indicates beach conditions. The coarse grained sandstone has 5% open space pores between sand grains.

Core Photo



VOLCANICLASTIC VISUAL CORE DESCRIPTION

197-1206A-45R-3 (Section top: 332.28 mbsf)

UNIT 22: LITHIC VITRIC SANDSTONE.

Pieces: 1-5

CONTACTS: None

GENERAL DESCRIPTION: This core interval consists of dark gray (5Y 4/1) to greenish black (2.5/10 BG), very fine to medium grained well sorted sandstone.
63-79 cm: Finely laminated, very fine grained sandstone.
85-116 cm: Moderately sorted shell fragment rich sandstone.

COLOR: 68-94 cm: dark greenish gray (5/5BG) to very dark greenish gray (4/10BG);
94-96 cm: light gray (2.5Y 7/2); 96-128 cm: black to reddish black (5YR 2.5/1).

COMPONENTS: 0-6 cm: 10% clay, 20% calcite, 20% basalt fragments, 40% volcanic glass fragments, 10% crystals (plagioclase, olivine).
6-52 cm: 15% calcite, 15% clay, 50% basalt fragments, 10% volcanic glass, 10% crystals (olivine, plagioclase).
52-62 cm: 15% clay, 20% basalt fragments, 20% volcanic glass (mostly altered), 5% celadonite, 5% shell fragments.
74-116 cm: 20% calcite (10% shell fragments), 20% clay, 5-10% shell debris, 20% basalt fragments, 40% volcanic glass (mostly altered).

SEDIMENTARY TEXTURES: 0-6 cm: Medium grained, poorly sorted sandstone.
6-52 cm: Very fine to fine sandstone, well sorted.
52-62 cm: Medium grained sandstone, moderately well sorted.
62-79 cm: Very fine grained, well sorted sandstone.
79-116 cm: Medium to coarse sandstone, poorly sorted.

SEDIMENTARY STRUCTURES: 0-6 cm: Structureless.
6-52 cm: Very fine laminations, partly slumped, outlined by larger (1 mm) grains of basalt, sandstone, graded bedding.
52-62 cm: Poorly expressed crossbedding
62-79 cm: Finely laminated to structureless sandstone.
79-116 cm: Indistinctly slump-disturbed sandstone.

COMMENTS: A varying environment, from high energy, high sedimentation rate, and poorly sorted sandstone, to slow sedimentation rate and very fine sedimentation in laminae in a calmer environment. Irregular slumping indicates a rapid change in sea level. A few large clasts at 13 cm (volcanic lapilli) and at 20 cm (broken basalt and shell fragments).

Hole 1206A **Thin Section Log**

Leg	Site	Hole	Core	Type	Section	Top (cm)	Bot (cm)	Depth (mbsf)	Piece	Comments	ICP?	UNIT	Ship Code
197	1206	A	3	R	2	94	96	60.84	8	Unit 1c sample	YES	1c	1433847
197	1206	A	4	R	2	92	95	68.40	9	Alteration-vein-vesicle-XRD		1h	1433860
197	1206	A	4	R	3	72	74	69.56	4A	Olivine-rich part of Unit 1 basalt. Next to ICP	YES	1h	1433858
197	1206	A	7	R	1	123	125	85.93	21	Small lobe in Unit 2c breccia	YES	2c	1433876
197	1206	A	8	R	1	2	3	90.42	1	Basalt above sediment, next to ICP	YES	4	1433906
197	1206	A	8	R	1	99	101	91.39	24	Unit 4 Olivine-rich basalt	YES	4	1433878
197	1206	A	8	R	2	2	3	91.92	1	Basalt below sediment, next to ICP	YES	4	1433909
197	1206	A	15	R	1	72	74	128.92	7A	Unit 5 Basalt, next to ICP	YES	5	1433888
197	1206	A	15	R	3	87	89	132.07	15	Unit 5 glomerocryst/xenolith		5	1433890
197	1206	A	16	R	4	80	82	138.29	8B	To compare with Unit 5	YES	6	1434023
197	1206	A	16	R	5	66	67	139.60	8	To compare with Unit 5	YES	6	1434025
197	1206	A	17	R	2	74	76	145.04	6	Olivine-rich basalt, next to ICP	YES	6	1433904
197	1206	A	18	R	1	49	51	152.89	4	Alteration, XRD		6	1433902
197	1206	A	18	R	1	80	83	153.20	4	Olivine-rich basalt to compare with 17R-2	YES	6	1434027
197	1206	A	19	R	3	46	48	157.26	4B	Unit 7 basalt, next to ICP	YES	7	1433918
197	1206	A	21	R	3	28	29	175.01	2C	Unit 8g hyaloclastite		8g	1433935
197	1206	A	21	R	5	66	68	178.39	9	Lobe in Unit 8h	YES	8h	1433933
197	1206	A	24	R	3	10	12	195.80	2	Unit 10 basalt, next to ICP	YES	10	1433944
197	1206	A	28	R	1	100	102	225.00	17C	Unit 11, aphyric basalt lobe next to ICP	YES	11p	1433960
197	1206	A	30	R	2	53	56	241.23	7	Sediment		12	1433972
197	1206	A	30	R	4	49	53	243.99	1	Sediment		12	1433973
197	1206	A	31	R	1	60	63	249.50	11	Unit 13 basalt next to ICP	YES	13	1433794
197	1206	A	32	R	2	136	137	261.36	26	Unit 14d basalt next to ICP	YES	14d	1433979
197	1206	A	38	R	1	55	58	297.45	2B	Unit 17 Picrite, near to ICP	YES	17	1434018
197	1206	A	41	R	1	22	24	311.32	5A	Unit 18b basalt next to ICP	YES	18b	1434039
197	1206	A	42	R	2	76	78	318.03	3	Unit 21 basalt next to ICP/PMAG	YES	21	1434048

Hole 1206A **Sedimentary Thin Section**

Sample									Biogenic		Rock			Other	
Site	Hole	Core	Core Type	Section	Top	Bottom	Depth (mbsf)	Lithology	Algae (red)	Foraminifers	Cement	Micrite	Volcanic Ash	Pore Space	Comments
1206	A	2	R	1	44	48	57.44	M	15	5	40	15	10	15	Calcite-cemented algal vitric grainstone. Lava fragments (volcanic ash) has flow structures and vesicles are rounded. Volcanic ash is palagonite in part. Micrite envelopes around open or filled pores.

THIN SECTION:	**197-1206A-3R-2, 94-96**		**Piece No.: 8**			**Unit: 1c**	**OBSERVER: JG, CRN, PT, SR.**
ROCK NAME:	Moderately olivine-phyric Basalt.						
WHERE SAMPLED:	Next to ICP sample.						
GRAIN SIZE:	Fine grained.						
TEXTURE:	Intersertal to subophitic.						

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	10	0.6	2	1.5	Subhedral to anhedral	Entirely replaced by brown clay. Contain embayments and hollow centers.
GROUNDMASS							
Plagioclase	32	32	0.1	0.7	0.5	Euhedral to subhedral laths	
Clinopyroxene	25	25	0.15	0.4	0.25	Subhedral to anhedral	
Titanomagnetite	7	7	0.5	0.2	0.1	Skeletal to dendritic	
Cr spinel	trace		0.02	0.08	0.05	Anhedral	Rimmed by titanomagnetite.
Glass	5	26					

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	2				Olivine and glass	Often has comb texture.
Iddingsite	15				Olivine and glass	
Zeolite	14				Glass	

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

COMMENTS:	Cr spinel and opaque morphology indicate a tholeiitic basalt. See Photomicrographs 1206-289 to 1206-292.	**Photomicrograph 1206-289.** Field of view 0.25 mm, RL. **Chapter 6, Figure F28A.** Field of view 0.25 mm, RL. **Chapter 6, Figure F26A.** Field of view 1.25 mm, RL. **Chapter 6, Figure F32A.** Field of view 0.25 mm, RL.

THIN SECTION:	**197-1206A-4R-2, 92-95**	**Piece No.: 9**	**Unit: 1h**	**OBSERVER: SR**
ROCK NAME:	Moderately olivine-phyric basalt.			
WHERE SAMPLED:	Alteration.			
GRAIN SIZE:	Fine grained.			
TEXTURE:	Intergranular.			

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	10	0.1	0.8	0.5	Euhedral	Totally replaced.
GROUNDMASS							
Plagioclase	28	30					Partially altered along fractures.
Clinopyroxene	15	15					
Titanomagnetite	5	5					
Glass	0	40					Totally altered.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Calcite	10				Vein	
Analcite	5				Vein, vesicle	
Zeolite	15				Vesicle, olivine, groundmass, vein	
Saponite-nontronite	10				Groundmass	Sometimes as incipient chlorite.
Serpentine	3				Olivine	
Sericite	2				Plagioclase	
Fe oxyhydroxide	7				Olivine	
Iddingsite						

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	20					Zeolite	
Vein						Calcite, analcite, zeolite	

COMMENTS: Photomicrographs 1206-306 and 1206-307: olivine replaced by serpentine and zeolite. Photomicrographs 1206-308 and 1206-309: vein filled with calcite and zeolite.

Photomicrograph 1206-306. Field of view 0.625 mm, XPL.
Photomicrograph 1206-307. Field of view 0.625 mm, PPL.
Photomicrograph 1206-308. Field of view 1.25 mm, XPL.
Photomicrograph 1206-309. Field of view 1.25 mm PPL.

THIN SECTION:	**197-1206A-4R-3, 72-74**	**Piece No.: 4A**			**Unit: 1h**	**OBSERVER: CRN, JG, PT, SR.**	
ROCK NAME:	Highly olivine-phyric basalt.						
WHERE SAMPLED:	Next to ICP.						
GRAIN SIZE:	Fine grained.						
TEXTURE:	Porphyrytic. Intergranular to intersertal.						

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	5	10	0.5	3	2	Euhedral to subhedral; equant	Partially altered to serpentine and green clay.
Plagioclase	1-2	1-2	0.5	1	0.5	Subhedral	Displays resorption features and deformation (twinning).
GROUNDMASS							
Plagioclase	30	30	0.1	0.5	0.4		
Clinopyroxene	22	22	0.05	0.2	0.1		
Titanomagnetite	7	6.5	<0.1	0.2	0.08	Skeletal octahedra and dendrites	Slight development of ilmenite oxidation lamellae.
Cr spinel	0.5	1	0.02	0.15	0.05	Euhedral inclusions in olivine	Usually rimmed with titanomagnetite. Occasional titanomagnetite-free.
Glass	0	30.5				Altered to green clay	Altered to green clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Serpentine	5				Olivine	Slightly thick section gives first order birefringence.
Green clay	28				Glass, olivine	
Titanomagnetite	0.5				Cr spinel	
Brown clay	1				Vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	1	Top of section			1	Brown clay	

COMMENTS: Photomicrograph 1206-293: Cr spinel in partially altered olivine. Photomicrograph 1206-294: Cr spinel with Ti-mag overgrowth. Photomicrograph 1206-295: Olivine with Cr spinel inclusions. Photomicrograph 1206-296: Olivine with Cr spinel inclusions. Photomicrograph 1206-297: Opaque morphologies. Photomicrograph 1206-301: Olivine replaced by serpentine. Photomicrograph 1206-302: Olivine replaced by serpentine. Photomicrograph 1206-303: Cr spinel inclusions in olivine. Photomicrograph 1206-304: Close up of Cr spinel. Photomicrograph 1206-329: Plagioclase phenocrysts. Photomicrograph 1206-330: Glomerocryst of plagioclase and clinopyroxene.

Chapter 6, Figure F33A. Field of view 1.25 mm, RL.
Chapter 6, Figure F33B. Field of view 0.25 mm, RL.
Chapter 6, Figure F31A. Field of view 1.25 mm, PPL.
Chapter 6, Figure F31B. Field of view 1.25 mm, RL.
Photomicrograph 1206-297. Field of view 1.25 mm RL.
Chapter 6, Figure F10. Field of view 5 mm, XPL.
Chapter 6, Figure F11. Field of view 5 mm, PPL.
Photomicrograph 1206-303. Field of view 1.25 mm, PPL.
Chapter 6, Figure F16. Field of view 5 mm, PPL.
Photomicrograph 1206-329. Field of view 1.25 mm, XPL.
Photomicrograph 1206-330. Field of view 1.25 mm, XPL.

THIN SECTION:	**197-1206A-7R-1, 123-125**	**Piece No.: 21**			**Unit: 2c**	**OBSERVER: CRN, JG, SR.**
ROCK NAME:	Highly olivine-phyric basalt.					
WHERE SAMPLED:	Lobe margin, next to ICP sample.					
GRAIN SIZE:	Aphanitic. Cryptocrystalline to holohyalline.					
TEXTURE:	Porphyritic.					

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0.5	4	1	4	2	Euhedral	Replaced by calcite. Rare unaltered centers in larger crystals.
Olivine	0	5	0.1	0.8	0.5	Euhedral	Quenched microphenocrysts. Altered to green clay.
GROUNDMASS							
Plagioclase	25.5	25.5	0.02	0.2	0.1	Subhedral laths	Laths have swallow-tail terminations indicative of quenching.
Clinopyroxene	1	1			<0.01	Anhedral	
Cr Spinel	0.5	0.5	<0.01	0.05	0.02	Subhedral to anhedral	Inclusions in altered olivine.
Glass	0	64					Devitrified and replaced by opaque brown clay.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Green clay	5				Vesicles, olivine	Nontronite/saponite with possible incipient chlorite.
Brown clay	11				Glass	
Calcite	3.5				Olivine	Sometimes as incipient micas.
Iddingsite	3				Olivine, glass	
Zeolite	50				Vesicles, glass	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	15					Green clay and zeolite, round.	

COMMENTS:	Photomicrograph 1206-305: Olivine microphenocrysts. Photomicrograph 1206-346: Vesicle filled with zeolite and lined by green clay.	**Chapter 6, Figure F24.** Field of view 0.625 mm, PPL. **Photomicrograph 1206-346.** Field of view 1.25 mm, PPL.

THIN SECTION:	**197-1206A-8R-1, 2-3**	**Piece No.: 1**	**Unit: 4**
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Fine grained.		
TEXTURE:	Porphyritic, intersertal.		

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	10	0.5	1.5	1	Euhedral to subhedral	Highlighted by iddingsite that forms the rim and pervades down fractures. Altered to serpentine.
Plagioclase	5	5	0.25	1.8	0.75	Subhedral laths	As phenocrysts and glomerocrysts with clinopyroxene.
Clinopyroxene	3	3	0.05	0.5	0.2	Subhedral	Only as glomerocrysts with plagioclase.
GROUNDMASS							
Plagioclase	35	37	0.02	0.3	0.15	Subhedral laths	Partially sericitized and altered to clay.
Clinopyroxene	1	5			0.2	Anhedral	Altered to brown clay.
Titanomagnetite	1.5	1.5			0.05	Dendritic	Altered to maghemite, extensive illmenite laminae.
Glass	0	38.5					
Cr spinel	Trace	Trace			0.03	Subhedral	Inclusions in altered olivine.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Serpentine	3				Olivine	
Iddingsite	2				Olivine	
Zeolite	48				Plagioclase, clinopyroxene, glass	
Maghemite	1.5				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	3	Random				Round to irregular, unfilled. Lined with brown clay.	

COMMENTS: Plagioclase and clinopyroxene glomerocrysts look like rip-up clasts entrained in the magma. One 4 mm wide segregation vesicle is present, consisting of segregated material (plumose altered clinopyroxene and titanomagnetite radiating off skeletal plagioclase). **Photomicrograph 1206-315.** Field of view 1.25 mm, PPL. **Chapter 6, Figure F25.** Field of view 5 mm, PPL.

THIN SECTION:	**197-1206A-8R-1, 99-101**	**Piece No.: 24**	**Unit: 4**
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic.		
TEXTURE:	Porphyritic, intersertal.		

OBSERVER: CRN, PT, JG, SR.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	4	0.8	1.5	1	Euhedral to subhedral	Highlighted by iddingsite that forms the rim and pervades down fractures. Altered to serpentine. Seriate to groundmass size.
Plagioclase	3	3	0.1	1	0.5	Subhedral laths	Glomerocrysts with clinopyroxene, and olivine.
Clinopyroxene	1	1	0.05	0.5	0.2	Subhedral	Glomerocrysts with plagioclase, and olivine.
GROUNDMASS							
Plagioclase	25	40	0.02	0.3	0.15	Subhedral laths	Partially sericitized and altered to clay.
Clinopyroxene	1	5			<0.05	Anhedral	Altered to brown clay.
Titanomagnetite	2	3			<0.05	Dendritic	Partially altered to maghemite and extensive ilmenite oxidation.
Cr spinel	Trace				<0.01	Subhedral	Inclusions in altered olivine.
Glass	0	44					

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Serpentine	3				Olivine	
Iddingsite	1				Olivine	
Zeolite	63				Plagioclase, clinopyroxene, glass	
Maghemite	1				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	5	Random				Round to irregular, unfilled	Unfilled or filled with analcite and rimmed with fibrous zeolite.

COMMENTS: Plagioclase and clinopyroxene glomerocrysts look like rip-up clasts entrained in the magma. Photomicrograph 1206-298: Olivine phenocryst. Photomicrographs 1206-299 and 1206-300: Olivine-plagioclase glomerocryst.

Photomicrograph 1206-298. Field of view 1.25 mm, PPL.
Photomicrograph 1206-299. Field of view 1.25 mm, PPL.
Photomicrograph 1206-300. Field of view 1.25 mm, PPL.

THIN SECTION: 197-1206A-8R-2, 2-3 **Piece No.: 1** **Unit: 4** **OBSERVER: PT, CRN**
ROCK NAME: Moderately olivine-plagioclase-clinopyroxene-phyric basalt.
WHERE SAMPLED: Below sediment, next to ICP sample.
GRAIN SIZE: Aphanitic.
TEXTURE: Porphyritic, intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	4	0.5	1	0.75	Euhedral to subhedral	Altered to iddingsite.
Plagioclase	3	3	0.1	0.7	0.4	Subhedral laths	
Clinopyroxene	1	1	0.25	1	0.5	Subhedral	
GROUNDMASS							
Plagioclase	4	40?	0.02	0.3	0.15	Subhedral laths	Partially sericitized and altered to clay.
Clinopyroxene	0	6				Anhedral	Altered to brown clay.
Titanomagnetite	1	3			0.05	Dendritic	Partially altered to maghemite with extensive ilmenite oxidation.
Cr spinel	Trace	Trace			0.02	Subhedral	Inclusions in olivine.
Glass	0	43					Altered to brown clay.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Iddingsite	4				Olivine	
Zeolite	85				Plagioclase, clinopyroxene, glass, lining vesicles.	
Maghemite	2				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	30	Random	1	3	2	Round to irregular, unfilled or filled with analcite and lined with zeolite.	

COMMENTS: Photomicrograph 1206-317: olivine altered to iddingsite. **Chapter 6, Figure F9.** Field of view 0.625 mm, PPL.

THIN SECTION:	**197-1206A-15R-1, 72-74**	**Piece No.: 7A**	**Unit: 5**
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic; microcrystalline.		
TEXTURE:	Porphyritic, intersertal.		

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	4	0.5	1.5	1	Euhedral to subhedral	Altered to serpentine and green clay.
Plagioclase	2.5	2.5	0.5	1.5	1	Subhedral to anhedral	Glomerocrysts with clinopyroxene and occasionally olivine. Also present as individual zoned and resorbed crystals.
Clinopyroxene	1	1	0.05	0.5	0.2	Subhedral	Glomerocrysts with plagioclase and occasionally olivine.
GROUNDMASS							
Plagioclase	40	40	0.2	0.7	0.4	Subhedral laths	
Clinopyroxene	25	25			<0.05	Anhedral	
Titanomagnetite	8	8			<0.05	Octahedral	Occasional ilmenite oxidation lamellae. Rare maghemite (Photomirographs 1206-323, 1206-324).
Glass	0	19.5					Altered to green clay.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Serpentine	3				Olivine	
Green clay	0.5				Olivine, glass	
Zeolite	18				Glass, lining vesicles	
Analcite	2				Vesicles	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	3	Random				Round to irregular, unfilled	<1% vesicles are filled with analcite and lined by zeolite.

COMMENTS: Plagioclase and clinopyroxene glomerocrysts look like rip-up clasts entrained in the magma. Photomicrograph 1206-310: Glomerocryst. Photomicrograph 1206-311:. Plagioclase phenocrysts with resorbed edges. Photomicrograph 323: Titanomagnetite overgrowth on Cr spinel. Photomicrograph 1206-324: General opaque mineral morphology.

Photomicrograph 1206-310. Field of view 1.25 mm.
Chapter 6, Figure F18. Field of view 0.625 mm.
Chapter 6, Figure F38. Field of view 0.25 mm.
Chapter 6, Figure F27A. Field of view 0.625 mm.

THIN SECTION:	**197-1206A-15R-3, 87-89**	**Piece No.: 15**			**Unit: 5**	**OBSERVER: PT, CRN, SR, JG.**	
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.						
WHERE SAMPLED:							
GRAIN SIZE:	Aphanitic.						
TEXTURE:	Porphyritic. Intersertal to subtrachytic.						

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	4	0.5	5	1	Euhedral to subhedral	Altered to serpentine and green clay.
Plagioclase	3	3	1	2	1.25	Subhedral to anhedral	Glomerocrysts with clinopyroxene and occasionally olivine. Also present as individual zoned and resorbed crystals.
Clinopyroxene	3	3	0.5	2	1.5	Subhedral	Glomerocrysts with plagioclase and occasionally olivine.
GROUNDMASS							
Plagioclase	40	40	0.02	0.7	0.4	Subhedral laths	
Clinopyroxene	25	25			<0.05	Anhedral	
Titanomagnetite	3	6			<0.05	Dendritic and skeletal octahedra	Partially altered to maghemite.
Chromite	Trace	Trace			<0.05	Euhedral	Inclusions in plagioclase and cpx in glomerocrysts.
Glass	0	19					Altered to green clay and zeolite.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Serpentine	1				Olivine	
Brown/green clay	20.5				Olivine, glass	
Iddingsite	1.5				Olivine	
Maghemite	3				Titanomagnetite	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	3	Random				Round to irregular, unfilled	Some contain a small amount of zeolite.

COMMENTS: Plagioclase and clinopyroxene glomerocrysts look like rip-up clasts entrained in the magma. Photomicrograph 1206-312: Glomerocrysts. Photomicrograph 1206-313: Glomerocrysts. Photomicrograph 1206-314: Glomerocrysts. Photomicrograph 1206-322: Maghemite along cleavage planes and edges of titanomagnetite. Photomicrograph 1206-325: Chromite inclusions in a clinopyroxene/plagioclase glomerocryst. Photomicrograph 1206-326: Maghemite alteration of titanomagnetite. Photomicrograph 1206-327: Differential alteration of titanomagnetite.

Chapter 6, Figure F19. Field of view 5 mm, XPL.
Chapter 6, Figure F20. Field of view 1.25 mm, XPL.
Chapter 6, Figure F21. Field of view 5 mm, XPL.
Chapter 6, Figure F23. Field of view 0.25 mm, XPL.
Chapter 6, Figure F40. Field of view 1.25 mm.
Chapter 6, Figure F29B. Field of view 0.25 mm
Chapter 6, Figure F30B. Field of view 0.25 mm.

THIN SECTION:	**197-1206A-16R-4, 80-82**	**Piece No.: 8B**			**Unit: 6**	**OBSERVER: JG, PT, CRN.**	
ROCK NAME:	Moderately olivine-plagioclase-phyric basalt.						
WHERE SAMPLED:	Next to ICP sample.						
GRAIN SIZE:	Fine grained.						
TEXTURE:	Intersertal.						

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	10	0.1	0.7	0.3	Subhedral to euhedral; equant	Replaced with green clay; rimmed with Iddingsite.
Plagioclase	1	1	0.3	0.6	0.4	Subhedral to anhedral	Fractured.
GROUNDMASS							
Plagioclase	27	30	0.1	0.4	0.3	Suhedral laths	Partially sericitized?
Clinopyroxene	32	34	0.15	0.3	0.25	Anhedral	Slightly altered to brown clay.
Glass	0	20					Replaced with brown clay and zeolite.
Titanomagnetite	5	5	<.01	0.02	0.05	Skeletal octahedra and dendrites	Slight development of illmenite oxidation lamellae.
Cr spinel	Trace				<0.05	Subhedral to euhedral	Inclusions in altered olivine.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	22				Olivine, clinopyroxene,glass	
Green clay	4				Olivine	
Iddingsite	7				Olivine	
Sericite	2				Plagioclase	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	2	Random	1	7	1.5	Unfilled or rimmed with green clay	Often surrounded by segregated material showing concentration of black oxides.

COMMENTS: 16R-4 is fine grained whereas 16R-5 is aphanitic. Plagioclase laths are wider and longer in 16R-4 than in 16R-5. Photomicrograph 1206-356: Olivine altered to iddingsite. Cr spinel inclusions are commonly found in relict olivines. Photomicrograph 1206-368: Cr spinel inclusions in altered olivines. Photomicrograph 1206-369: Cr spinel inclusions in altered olivines. Photomicrograph 1206-370: Cr spinel inclusions in altered olivines.

Chapter 6, Figure F12. Field of view 0.625 mm.
Photomicrograph 1206-368.
Photomicrograph 1206-369.
Photomicrograph 1206-370.

THIN SECTION:	**197-1206A-16R-5, 66-67**	**Piece No.: 8**	**Unit: 6**
ROCK NAME:	Moderately olivine-plagioclase-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic.		
TEXTURE:	Subtrachytic to subophitic.		

OBSERVER: JG, PT, CRN.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	10	0.1	1.5	0.4	Euhedral. Particularly well-defined edges.	Occasionally glomerocrystic. Replaced with brown clay and lined with iddingsite. Includes microphenocrysts (may be groundmass?).
Plagioclase	<1	1					
GROUNDMASS							
Plagioclase	35	35	0.1	0.5	0.2	Subhedral to euhedral	
Clinopyroxene	<1	15	0.1	0.5	0.3	Anhedral	Replaced by brown clay and iddingsite.
Titanomagnetite	2	2			0.025	Skeletal and dendritic	Possible alteration to maghemite-too small for positive identification.
Glass	0	36					
Cr spinel	1	1	0.03	0.07	0.05	Euhedral to subhedral	Inclusions in altered olivine.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown clay	46				Olivine, glass	
Zeolite	12				Vesicles	
Iddingsite	4				Olivine	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	20	Throughout	0.4	7	1	Rimmed by zeolite and green clay, occasionally contain calcite. Usually empty.	

COMMENTS: 16R-5 is much more vesicular than 16R-4. Photomicrographs 1206-354 and 1206-355: Olivine. Photomicrographs 1206-371 to 1206-373: Cr spinel inclusions in altered olivines.

Photomicrograph 1206-354. Field of view 5 mm.
Photomicrograph 1206-355. Field of view 5 mm.
Chapter 6, Figure F39A. Field of view 0.625 mm.
Chapter 6, Figure F39B. Field of view 0.625 mm.
Photomicrograph 1206-373. Field of view 0.625 mm.

THIN SECTION:	**197-1206A-17R-2, 74-76**	**Piece No.: 6**			**Unit: 6**	**OBSERVER: JG, PT, CRN, SR.**
ROCK NAME:	Moderately olivine-phyric basalt.					
WHERE SAMPLED:	Next to ICP sample.					
GRAIN SIZE:	Aphanitic, microcrystalline.					
TEXTURE:	Porphyritic; intergranular.					

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	10	0.1	2	0.6	Euhedral to subhedral; occasionally glomerophyric	Replaced by serpentine and iddingsite.
GROUNDMASS							
Plagioclase	32	32	0.05	0.15	0.1	Euhedral to subhedral laths	
Clinopyroxene	28	28	0.05	0.1	0.08	Anhedral	
Titanomagnetite	10	10	0.03	0.15	0.05	Skeletal octahedra; dendritic	
Chromite	<1	<1			<.05		Usually surrounded by titanomagnetite, or within olivine.
Glass	0	20					

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	20				Vesicles, olivine, glass	Possibly iddingsite or incipient micas.
Iddingsite	4				Olivine	
Serpentine	6				Olivine	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vein	1	Left, middle			0.1	Brown clay	
Vesicles	3	Throughout				Brown clay	

COMMENTS:	Photomicrograph 1206-321: Olivine glomerocryst, altered to brown clay and Fe oxyhydroxide.	**Photomicrograph 1206-321.** Field of view 1.25 mm, PPL.

THIN SECTION:	**197-1206A-18R-1, 49-51**	**Piece No.: 4**	**Unit: 6**
ROCK NAME:	Moderately olivine-phyric basalt.		
WHERE SAMPLED:	Alteration.		
GRAIN SIZE:	Fine grained.		
TEXTURE:	Porphyritic. Intergranular.		

OBSERVER: SR, CRN, PT.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	14	24	0.8	5	1.5	Euhedral	Partially replaced by serpentine and lined by iddingsite.
Cr spinel	1	1	0.3	0.5	0.4	Euhedral	Titanomagnetite rims are present (Photomicrograph 1206-332).
GROUNDMASS							
Plagioclase	30	30	0.05	0.3	0.2	Subhedral laths	
Clinopyroxene	25	25	0.02	0.08	0.04	Anhedral	
Glass	0	15					
Cr spinel	1	1	0.05	0.15	0.1	Subhedral	Outside olivine, many have titanomagnetite rims. Unaltered inclusions in olivine.
Titanomagnetite	4.5	5	<0.01	0.05	0.02	Dendritic and skeletal octahedra	Slight development of maghemite. Rims on Cr spinel.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Serpentine	7				Olivine	
Iddingsite	3				Rimming olivine	
Zeolite	12				Groundmass	
Green clay	2				Groundmass	
Maghemite	0.5				Titanomagnetite	

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

COMMENTS: The sample appears relatively unaltered in thin section. Photomicrograph 1206-328: Olivine highlighted by iddingsite with unaltered centers. Photomicrograph 1206-331: Cr spinel with titanomagnetite overgrowth. Photomicrograph 1206-332: Cr spinel phenocryst with titanomagnetite overgrowth. Photomicrograph 1206-333: Wide view of 1206-331. Photomicrographs 1206-357 to 1206-359: Unaltered olivines.

Chapter 6, Figure F36A. Field of view 5 mm.
Chapter 6, Figure F35A. Field of view 0.25 mm.
Photomicrograph 1206-332. Field of view 1.25 mm.
Photomicrograph 1206-333. Field of view 0.625 mm.
Chapter 6, Figure F13. Field of view 5 mm.
Chapter 6, Figure F14. Field of view 5 mm.
Chapter 6, Figure F15. Field of view 5 mm.

THIN SECTION: 197-1206A-18R-1, 80-83 **Piece No.: 4** **Unit: 6** **OBSERVER: CRN**
ROCK NAME: Highly olivine-phyric basalt.
WHERE SAMPLED: Olivine-rich basalt to compare with 17R-2. Next to ICP sample.
GRAIN SIZE: Aphanitic. Microcrystalline.
TEXTURE: Porphyritic. Intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	max.	av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	0	15	0.5	4	2	Euhedral to subhedral	Rimmed by iddingsite, altered to serpentine, and replaced by calcite.
Cr spinel	1	1	0.3	0.7	0.5	Euhedral	
GROUNDMASS							
Plagioclase	30	38	0.05	0.2	0.1	Subhedral laths	Partially altered to clay.
Clinopyroxene	24	30	0.01	0.1	0.03	Subhedral to anhedral	Partially altered to clay.
Titanomagnetite	3	5	<0.01	0.12	0.1	Skeletal octahedra and dendrites	Partially altered to maghemite.
Cr spinel	1	1	0.05	0.2	0.09	Subhedral	Inclusions in altered olivine.
Glass	0	10					Altered to clay.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	max.	av.	REPLACING / FILLING	COMMENTS
Serpentine	8				Olivine	
Calcite	8				Olivine, vesicles	
Brown/green clay	20				Glass, plagioclase, clinopyroxene	
Zeolite	3				Vesicles	
Maghemite	2				Titanomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	max.	av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	5	Throughout	0.5	2	1	Calcite, zeolite, segregated material/round to irregular	

COMMENTS: Segregated material in the vesicles is a darker color and finer grained than the basalt matrix. Photomicrograph 1206-374: Maghemite alteration of titanomagnetite. Photomicrograph 1206-375: Altered and unaltered titanomagnetite. Photomicrograph 1206-376: Olivine phenocrysts with iddingsite rims and Cr spinel inclusions. Photomicrograph 1206-377: Olivine phenocrysts with iddingsite rims and Cr spinel inclusions. Photomicrograph 1206-378: Cr spinel phenocrysts with titanomagnetite overgrowths. Photomicrograph 1206-379: Cr spinel phenocrysts with titanomagnetite overgrowths. Photomicrograph 1206-380: Close-up of 1206-379.

Photomicrograph 1206-374. Field of view 0.25 mm.
Chapter 6, Figure F30A. Field of view 0.625 mm.
Photomicrograph 1206-376. Field of view 5 mm.
Photomicrograph 1206-377. Field of view 5 mm.
Chapter 6, Figure F35B. Field of view 1.25 mm.
Chapter 6, Figure F34A. Field of view 0.625 mm.
Chapter 6, Figure F34B. Field of view 0.625 mm.

THIN SECTION:	**197-1206A-19R-3, 46-48**	**Piece No.: 4B**			**Unit: 7**	**OBSERVER: PT, CRN, JG, SR.**
ROCK NAME:	Moderately olivine-phyric basalt.					
WHERE SAMPLED:	Next to ICP sample.					
GRAIN SIZE:	Aphanitic.					
TEXTURE:	Intersertal.					

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	3	0.5	0.8	0.7	Subhedral	Altered to iddingsite.
GROUNDMASS							
Plagioclase	40	40	0.1	0.4	0.3	Euhedral laths	
Clinopyroxene	27	30	0.03	0.4	0.1	Anhedral	
Olivine	0	10	0.1	0.3	0.15	Euhedral	Altered to iddingsite.
Titanomagnetite	5	5			0.05	Skeletal octahedra and dendrites	Faint ilmenite oxidation lamellae.
Glass	0	12					Altered to brown clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Iddingsite	13				Olivine	
Brown clay	12				Glass	
Pyrite	Trace				Glass	
Zeolite	3				Lining vesicles, glass	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	1	Bottom of slide			2	Lined by zeolite.	

COMMENTS: The olivine in the groundmass may possibly be microphenocrystic. Photomicrographs 1206-319 and 1206-320: Large cpx crystals (glomerocryst - are these phenocrysts?) surrounding olivine microphenocryst(?). Photomicrograph 1206-334: Morphology of opaque minerals.

Photomicrograph 1206-319. Field of view 5 mm.
Photomicrograph 1206-320. Field of view 1.25 mm.
Photomicrograph 1206-334. Field of view 1.25 mm.

THIN SECTION:	**197-1206A-21R3, 28-29**	**Piece No.: 2C**	**Unit: 8g**
ROCK NAME:	Hyaloclastite breccia.		
WHERE SAMPLED:			
GRAIN SIZE:	Coarse grained.		
TEXTURE:	Vesicular altered glass shards.		

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	max.	av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
GLASS PARTICLES								
Vesicular shards	50							All glass is altered to brown clay or smectite.
Blocky shards	0							
Cuspate shards	20							
CRYSTALS	1							
LITHICS								

MATRIX	PERCENT	OCCURRENCE	COMMENTS
Saponite	20		Saponite forms the rim of most vesicles.
Zeolite	10		Zeolite is filling interior of vesicles with radial aggregates.
Smectite	2		Smectite rims some vesicles.

COMMENTS:	Photomicrograph 1206-349: Vesicular glass shards, altered to brown clay and smectite.	**Chapter 6, Figure F22.** Field of view 1.25 mm, PPL.

THIN SECTION:	**197-1206A-21R-5, 66-68**	**Piece No.: 9**	**Unit: 8h**
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic.		
TEXTURE:	Porphyritic, intersertal.		

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	1	0.6	1	0.8	Euhedral	Difficult to distinguish.
Plagioclase	4	4	0.2	0.6	0.4	Subhedral laths	Partially resorbed.
Clinopyroxene	Trace	Trace	0.25	0.5	0.35	Subhedral	
GROUNDMASS							
Plagioclase	35	40	0.05	0.3	0.15	Euhedral laths	Partially sericitized and altered to clay.
Clinopyroxene	0	13	0.15	0.3	0.2	Anhedral	Altered to brown clay.
Olivine	0	5	0.05	0.15	0.1	Euhedral	Believed to be a groundmass phase as contains plagioclase inclusions? See Photomicrograph 1206-382.
Glass	0	37					Altered to brown clay, zeolite.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Iddingsite	4				Olivine	
Brown clay	30				Plagioclase, clinopyroxene, glass, vesicles, olivine	
Zeolite	27				Lining vesicles, glass	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	30	Random	1	3	2	Round, unfilled, lined with brown clay and zeolite	

COMMENTS:	Photomicrograph 1206-318 of blue high relief, high reflectance minerals in section - corundum from thin sectioning process. No opaque minerals are present.	**Photomicrograph 1206-318.** Field of view 0.625 mm, XPL.

THIN SECTION:	**197-1206A-24R-3, 10-12**	**Piece No.: 2**	**Unit: 10**
ROCK NAME:	Moderately olivine-plagioclase-clinopyroxene-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic.		
TEXTURE:	Porphyritic, intersertal.		

PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm) min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Plagioclase	4	4	0.5	0.8	0.7	Subhedral laths	Seriate texture with groundmass. Occasionally forms glomerocrysts with olivine.
Olivine	0	4	0.5	0.8	0.7	Subhedral	Altered to iddingsite and brown clay.
GROUNDMASS							
Plagioclase	40	40	0.2	0.4	0.3	Euhedral laths	
Clinopyroxene	25	25	0.03	0.15	0.09	Anhedral	
Titanomagnetite	5	5			0.05	Both euhedral and dendritic	Displays spectactular alteration to maghemite along cleavage planes. Extensive development of ilmenite oxidation lamellae. Photomicrographs 1206-335, 1206-336.
Glass	0	22					Altered to brown clay.

SECONDARY MINERALOGY	**PERCENT**	**SIZE (mm) min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Iddingsite	4				Olivine	
Brown clay	12				Glass, olivine	
Celadonite	7				Glass	
Zeolite	3				Vesicles	

VESICLES/ CAVITIES	**PERCENT**	**LOCATION**	**SIZE (mm) min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	30	Random	1	3	2	Round, unfilled, lined with brown clay and zeolite.	

COMMENTS: Several round areas of segregated material are present, showing no vesicles but a concentration of titanomagnetite. Photomicrograph 1206-335: Maghemite along titanimagnetite cleavage planes. Photomicrograph 1206-336: Ilmenite oxidation lamellae in titanomagnetite.

Chapter 6, Figure F29A. Field of view 0.25 mm.
Chapter 6, Figure F28B. Field of view 0.25 mm.

THIN SECTION:	**197-1206A-28R-1, 100-102**	**Piece No.: 17C**				**Unit: 11p**	**OBSERVER: PT, JG, SR, CRN.**
ROCK NAME:	Moderately olivine-plagioclase-phyric basalt.						
WHERE SAMPLED:	Next to ICP sample.						
GRAIN SIZE:	Aphanitic.						
TEXTURE:	Porphyritic, intersertal.						

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Plagioclase	4	4	0.2	1.5	0.7	Subhedral laths	Often resorbed and zoned. Frequently forms glomerocrysts.
Olivine	0	4	0.8	2	2.5	Subhedral	Altered to calcite and brown clay.
GROUNDMASS							
Plagioclase	40	40	0.05	0.3	0.2	Euhedral laths	Often have swallow-tail texture on ends.
Clinopyroxene	2	22	0.03	0.15	0.09	Anhedral	Altered to brown clay.
Cr spinel	Trace	Trace					Inclusions in relict olivine. Photomicrograph 1206-337.
Glass	0	30					Altered to brown clay.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Calcite	1				Olivine	
Brown clay	25				Glass, olivine, clinopyroxene, lining vesicles	
Zeolite	28					
Analcite	<<1					

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	6	Random	1	3	2	Large one filled with calcite and analcite, smaller ones lined with zeolite.	Photomicrograph 1206-338 of vesicle infilling.
Vein	1	Bottom edge			0.25	Celadonite	

COMMENTS:	Photomicrograph 1206-337: Relict olivine with Cr spinel inclusion. Photomicrograph 1206-338: Vesicle filled with zeolites(?).	**Photomicrograph 1206-337.** Field of view 0.625 mm. **Photomicrograph 1206-338.** Field of view 5 mm.

THIN SECTION:	**197-1206A-30R-2, 53-56**	**Piece No.: 7**	**Unit: 12**
ROCK NAME:	Calcareous vitric-lithic sandstone.		
WHERE SAMPLED:			
GRAIN SIZE:	Fine to medium grained.		
TEXTURE:	Moderately well sorted.		

OBSERVER: SL

COMPONENTS	PERCENT PRESENT	PERCENT VESICLES	SIZE (mm) min.	max.	av.	APPROXIMATE COMPOSITION	MORPHOLOGY	COMMENTS
GLASS PARTICLES								
Vesicular shards	2							Saponite, smectite.
Blocky shards	10							
Cuspate shards	5							
CRYSTALS	5							Plagioclase, calcite, olivine.
LITHICS	20							

MATRIX	PERCENT	OCCURRENCE	COMMENTS
Biogenic debris	38		Shell debris 61%, red algae 20%, benthic foraminifers 10%, algal borings 2%, bryozoans 2%, and bivalves 5%.
calcite cement	20		
pyrite	2		

COMMENTS: Photomicrograph 1206-342: Cuspate glass shard surrounded by basalt clasts and calcite matrix.

Photomicrograph 1206-342. Field of view 0.625 mm, PPL.

THIN SECTION:	**197-1206A-30R-4, 49-53**	**Piece No.: 1**	**Unit: 12**	**OBSERVER: SL**
ROCK NAME:	Calcareous Lithic Vitric Sandstone.			
WHERE SAMPLED:				
GRAIN SIZE:	Fine to medium grained.			
TEXTURE:	Moderately well sorted.			

	PERCENT	PERCENT	SIZE (mm)			APPROXIMATE		
COMPONENTS	**PRESENT**	**VESICLES**	**min.**	**max.**	**av.**	**COMPOSITION**	**MORPHOLOGY**	**COMMENTS**
GLASS PARTICLES								
Vesicular shards	10	20						
Blocky shards	10							
Cuspate shards	10							
CRYSTALS	5							Plagioclase, clinopyroxene.
LITHICS	20							Basalt clasts.

MATRIX	**PERCENT**	**OCCURRENCE**	**COMMENTS**

COMMENTS: Photomicrograph 1206-344: Vitric fragment with vesicular texture. Photomicrograph 1206-345: Foraminifer and echinoid fragment.

Photomicrograph 1206-344. Field of view 1.25 mm, PPL.
Photomicrograph 1206-345. Field of view 1.25 mm, PPL.

THIN SECTION: 197-1206A-31R-1, 60-63 **Piece No.:** 11 **Unit:** 13 **OBSERVER:** PT, JG, SR, CRN.
ROCK NAME: Moderately olivine-plagioclase-phyric basalt.
WHERE SAMPLED: Next to ICP sample.
GRAIN SIZE: Aphanitic.
TEXTURE: Porphyritic, intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Plagioclase	1	1	0.2	0.6	0.4	Subhedral laths	Strongly resorbed and zoned. Frequently forms glomerocrysts.
Olivine	1	4	0.2	0.6	0.3	Subhedral	Some unaltered. Some altered microphenocrysts - not groundmass?
Clinopyroxene	<1	<1	0.7	0.5	0.4	Subhedral	
GROUNDMASS							
Plagioclase	40	40	0.05	0.2	0.1	Elongate laths	
Clinopyroxene	3	25?	0.03	0.15	0.09	Anhedral	Partially altered to brown clay.
Titanomagnetite	4	5			<0.02	Anhedral, dendritic	Partially altered to maghemite along cleavage.
Glass	0	25					Altered to brown clay, zeolite.
Cr spinel	Trace	Trace					Inclusions in olivine. Photomicrograph 1206-339.
Sulfide	Trace	Trace					Primary, in blebs.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Brown clay	35				Glass, olivine, lining vesicles	
Zeolite	11					
Iddingsite	4				Olivine	
Maghemite	1				Ttianomagnetite	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	10	Random	1	4	2.5	Unfilled or lined with zeolite	

COMMENTS: Photomicrograph 1206-339: Unaltered olivine with Cr spinel inclusions. Photomicrograph 1206-340: Strongly resorbed plagioclase - outer rim remains and part of inner core.

Photomicrograph 1206-339. Field of view 0.625 mm.
Photomicrograph 1206-340. Field of view 0.625 mm, XPL.

THIN SECTION: 197-1206A-32R-2, 136-137 **Piece No.: 26** **Unit: 14d** **OBSERVER: PT, JG, SR, CRN.**
ROCK NAME: Moderately olivine-plagioclase-phyric basalt.
WHERE SAMPLED: Next to ICP sample.
GRAIN SIZE: Aphanitic.
TEXTURE: Porphyritic, intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	max.	av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Clinopyroxene	1	2	0.2	0.3	0.3	Subhedral to anhedral	Forms glomerocrysts along with plagioclase and rarely olivine.
Plagioclase	1	1	0.2	0.6	0.4	Subhedral laths	Strongly resorbed and zoned. Frequently forms glomerocrysts.
Olivine	1	4	0.2	0.5	0.3	Subhedral	Some unaltered. Some altered microphenocrysts.
GROUNDMASS							
Plagioclase	37	43	0.06	0.2	0.1	Euhedral to subhedral laths; sometimes acicular.	Partially altered to brown clay.
Clinopyroxene	14	20	0.05	0.1	0.75	Subhedral to anhedral	Partially altered to brown clay.
Cr spinel	Trace				<0.01	Euhedral	Inclusions in olivine. Photomicrograph 1206-347.
Glass		30					Altered to brown clay.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	max.	av.	REPLACING / FILLING	COMMENTS
Brown clay	30				Glass, olivine, lining vesicles	
Celadonite	8				Vesicles, groundmass	
Zeolite	5				Vesicles	
Iddingsite	1				Olivine, vesicles	
Calcite	1				Olivine	
Analcite	1				Vesicles	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm) min.	max.	av.	FILLING / MORPHOLOGY	COMMENTS
Vesicles	4	Random	0.15	0.45	0.25	Zeolite, green clay (celadonite).	

COMMENTS: Photomicrographs 1206-347 and 1206-348: Vesicle filled with celadonite and iddingsite.

Photomicrograph 1206-347. Field of view 1.25 mm.
Photomicrograph 1206-348. Field of view 1.25 mm.

THIN SECTION:	**197-1206A-38R-1, 55-58**	**Piece No.: 2B**	**Unit: 17**
ROCK NAME:	Moderately olivine-phyric basalt.		
WHERE SAMPLED:	Next to ICP sample.		
GRAIN SIZE:	Aphanitic.		
TEXTURE:	Porphyritic.		

OBSERVER: JG, PT, CRN.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	MORPHOLOGY	COMMENTS
PHENOCRYSTS							
Olivine	6	10	1	3.5	2	Equant to elongate; euhedral	Variably altered. Some are totally unaltered, some have an altered rim, and some are completely replaced by serpentine and or brown clay.
Cr spinel	2.5	2			0.15	Round	Occurs as a phenocryst phase; most have reacted out to titanomagnetite, remnant Cr spinel contours are present.
GROUNDMASS							
Plagioclase	34	34	0.05	0.2	0.15	Elongate	Appear unaltered.
Clinopyroxene	36	36			0.05	Anhedral	
Titanomagnetite	9.5	9	<0.01	0.25	0.05		
Mesostasis/glass	0	9					
Cr spinel	Trace				<0.05	Euhedral	Inclusions in olivine.

SECONDARY MINERALOGY	PERCENT	SIZE (mm) min.	SIZE (mm) max.	SIZE (mm) av.	REPLACING / FILLING	COMMENTS
Serpentine	2				Olivine	
Brown clay	2				Olivine	
Zeolite	8				Mesostasis and dictytaxitic voids?	Photomicrograph 1206-352 and 353 of zeolite infilling dictytaxitic voids?

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

COMMENTS: Photomicrographs 1206-349 and 1206-350: Cr spinels. Photomicrograph 1206-351: Unaltered olivines. Photomicrographs 1206-352 and 1206-353: Zeolite in dictytaxitic voids(?). Photomicrograph 1206-360: Cr spinel in olivine + groundmass titanomagnetite. Photomicrograph 1206-361: Ilmenite oxidation lamellae. Photomicrograph 1206-362: Cr spinel with large titanomagnetite overgrowth. Photomicrograph 1206-363: 2 large titanomagnetites formed by replacement of Cr spinel. Photomicrograph 1206-364: Cr spinel with titanomagnetite overgrowths + groundmass titanomagnetite. Photomicrograph 1206-384: Altered olivine with Cr spinel inclusions + Cr spinel phenocrysts.

Chapter 6, Figure F22. Field of view 1.25 mm.
Photomicrograph 1206-350. Field of view 1.25 mm.
Photomicrograph 1206-351. Field of view 5 mm.
Photomicrograph 1206-352. Field of view 1.25 mm.
Photomicrograph 1206-353. Field of view 1.25 mm.
Photomicrograph 1206-360. Field of view 1.25 mm.
Chapter 6, Figure F37A. Field of view 0.625 mm.
Chapter 6, Figure F37B. Field of view 0.625 mm.
Chapter 6, Figure F37C. Field of view 0.625 mm.
Chapter 6, Figure F37D. Field of view 0.625 mm.
Chapter 6, Figure F36B. Field of view 5 mm.

THIN SECTION:	**197-1206A-41R-1, 22-24**		**Piece No.: 5A**			**Unit: 18b**	**OBSERVER: PT, CRN.**
ROCK NAME:	Sparsely olivine-phyric basalt.						
WHERE SAMPLED:	Next to ICP sample.						
GRAIN SIZE:	Aphanitic.						
TEXTURE:	Intergranular to intersertal; subophitic in places.						

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	3	0.2	1.2	0.6	Equant, euhedral	Altered to brown clay and iddingsite.
GROUNDMASS							
Plagioclase	41	41	0.4	0.8	0.6		
Clinopyroxene	40	40	0.05	0.6	0.4	Anhedral	Larger ones are subophitic.
Titanomagnetite	6	6	0.05	0.3	0.15	Skeletal octahedra, dendritic	Illmenite oxidation lamellae are well developed. Rare maghemite along fractures.
Mesostasis/glass	0	10					
Cr spinel	Trace	Trace	<0.01	0.07	0.05		Inclusions in Olivine. Most have reacted out - Photomicrograph 1206-365.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	2.5				Olivine	
Iddingsite	0.5				Olivine	

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	5	Random	0.5	2	1		Surrounded by segregated material.

COMMENTS:	Rock consists of 2% segregated material. Photomicrograph 1206-365: Cr spinel inclusions in altered olivine with groundmass titanomagnetite. Photomicrograph 1206-366: General morphology of titanomagnetite.	**Chapter 6, Figure F32B.** Field of view 0.625 mm. **Chapter 6, Figure F26B.** Field of view 1.25 mm.

THIN SECTION:	**197-1206A-42R-2, 76-78**		**Piece No.: 3**			**Unit: 21**	**OBSERVER: CRN**
ROCK NAME:	Moderately plagioclase-olivine-clinopyroxene-phyric basalt.						
WHERE SAMPLED:	Next to ICP sample.						
GRAIN SIZE:	Aphanitic. Microcrystalline.						
TEXTURE:	Subtrachytic to intergranular.						

PRIMARY	**PERCENT**	**PERCENT**	**SIZE (mm)**				
MINERALOGY	**PRESENT**	**ORIGINAL**	**min.**	**max.**	**av.**	**MORPHOLOGY**	**COMMENTS**
PHENOCRYSTS							
Olivine	0	2	0.2	0.6	0.1	Euhedral	Completely altered to brown clay.
Plagioclase	5	5	0.5	1.5	0.8	Subhedral, lath to blocky	Partially resorbed and occasionally . Forms discrete phenocrysts and glomerocrysts with plagioclase.
Clinopyroxene	1	1	0.3	1.1	0.5	Subhedral	Found as glomerocrysts with plagioclase, rarely are discrete phenocrysts.
GROUNDMASS							
Plagioclase	30	33	0.05	0.25	0.1	Subhedral laths	
Clinopyroxene	35	37	0.02	0.1	0.05	Anhedral	
Titanomagnetite	10	10	<0.01	0.04	0.03	Subhedral and skeletal octahedra	Slight development of ilmenite oxidation lamellae.
Mesostasis/glass	0	7					Altered to brown clay.
Olivine	0	5	0.08	0.25	0.1	Euhedral	Completely altered to brown clay and highlighted by a rim of black amorphous material. Occasional skeletal forms suggest quench crystallization.

SECONDARY		**SIZE (mm)**				
MINERALOGY	**PERCENT**	**min.**	**max.**	**av.**	**REPLACING / FILLING**	**COMMENTS**
Brown clay	17					
Zeolite	2					

VESICLES/			**SIZE (mm)**				
CAVITIES	**PERCENT**	**LOCATION**	**min.**	**max.**	**av.**	**FILLING / MORPHOLOGY**	**COMMENTS**
Vesicles	5		0.2	0.7	0.5	Empty/irregular	May have been filled with zeolite that have been plucked out during polishing.

COMMENTS:	Olivine is seriate between phenocryst and groundmass. Photomicrograph 1206-381: Altered olivine, euhedral and skeletal forms. Photomicrograph 1206-383: General morphology of titanomagnetite.	**Photomicrograph 1206-381.** Field of view 1.25 mm. **Chapter 6, Figure F27B.** Field of view 0.625 mm.

Hole 1206A **Alteration Log**

Unit	Core	Section	Section Top (mbsf)	Alteration Degree	FeOx	CaCO3	Brn C	GC	Py	Cel	Zeol	Vesicularity	CaCO3	Brn C	GC	Py	DKGC	Zeol	FeOx
1	2R	1	57	1		x		x	x			2	x		x	x		x	
1	2R	2	58.23	2.5		x		x	x			2	x		x	x		x	
1	3R	1	58.5	2	x			x				2	x		x			x	
1	3R	2	59.9	2	x			x		x		2	x		x		x	x	
1	3R	3	61.35	2	x		x	x		x		3	x	x	x		x		x
1	3R	4	62.83	3	x	x		x				3	x	x	x				x
1	3R	5	64.33	3	x	x		x		x		3	x	x	x		x		x
1	3R	6	65.83	3	x	x		x		x		3	x	x	x		x		x
1	4R	1	66.1	3	x	x	x	x				3	x	x	x				x
1	4R	2	67.48	2	x	x				x		2	x				x		
1	4R	3	68.84	2	x	x		x				2.5	x		x				
1	4R	4	70.29	3	x	x		x				3	x		x				
1	4R	5	71.7	3	x	x		x				3	x		x				
2B	6R	2	81.3	3	x	x		x			x	2	x		x		x	x	
4	7R	3	87.65	2	x			x				3	x						
4	7R	4	89.01	2	x			x				3	x						
4	8R	1	90.4	2	x		x	x				2.5					x	x	
4	8R	2	91.9	2	x		x	x				3	x				x		x
4	8R	3	93.36	2	x			x			x	3							x
4	9R	1	94.7	2	x		x	x				3							x
4	9R	2	96.2	2.5	x			x			x	2	x				x		
4	10R	1	104.4	1	x			x				1			x				
4	11R	1	106.1	1	x							2			x				
4	12R	1	114	1	x			x				2			x				
4	13R	1	118.7	1.5	x							1			x				
4	14R	1	123.6	2	x			x				2	x		x				x
4	14R	2	125.1	1	x		x	x				2	x	x	x			x	x
5	15R	1	128.2	1	x		x	x				2	x	x	x			x	x
5	15R	2	129.7	1	x			x				1	x		x			x	x
5	15R	3	131.2	1	x			x				1	x		x			x	x
5	15R	4	132.7	1	x			x				2						x	
5	16R	1	133.2	2.5	x	x		x				1.5	x		x				
6	16R	2	134.67	2.5	x			x		x		2.5	x				x		
6	16R	3	135.99	2	x	x		x				2	x		x				
6	16R	4	137.49	2.5	x	x		x				2	x		x				
6	16R	5	138.94	2.5	x	x		x				2	x		x				
6	16R	6	140.44	3	x	x		x				2	x		x				
6	17R	1	142.8	3	x	x		x				3	x		x				x
6	17R	2	144.3	3.5	x	x		x				3	x		x				
6	18R	1	152.4	3	x			x				3	x		x				x
6	18R	2	153.87	3	x			x				2.5			x			x	
6	19R	1	153.8	3	x			x				3	x		x		x		x
7	19R	2	155.3	2	x			x			x	2.5	x		x		x		x
7	19R	3	156.8	2	x			x			x	2.5						x	
7	20R	1	162.2	1.5	x			x				2	x				x		x
7	20R	2	163.61	1.5	x			x				3			x		x		
7	20R	3	165.03	2	x		x	x				2			x			x	x
7	20R	4	166.53	1.5	x		x	x			x	3	x		x				
7	21R	1	171.8	3	x			x			x	3			x		x	x	
8	21R	2	172.28	1	x						x	3	x				x	x	
8	21R	3	173.78	2.5	x						x	3	x		x			x	
8	21R	5	177.73	1	x			x				2	x		x			x	
8	22R	1	181.4	1.5	x						x	2	x		x			x	
8	22R	2	182.89	1	x	x		x				1	x		x			x	
8	22R	3	184.39	2	x		x				x	2	x		x			x	
10	22R	4	185.89	2	x		x	x			x	2	x	x					
10	23R	1	191	1	x							1.5						x	
10	24R	1	192.7	1.5	x			x			x	1						x	

Hole 1206A **Alteration Log**

Unit	Core	Section	Section Top (mbsf)	Alteration Degree	FeOx	CaCO3	Brn C	GC	Py	Cel	Zeol	Vesicularity	CaCO3	Brn C	GC	Py	DKGC	Zeol	FeOx
10	24R	2	194.2	1.5	x			x			x	1.5			x			x	
10	24R	3	195.7	1.5	x			x			x	2			x			x	
10	24R	4	197.13	2	x		x	x			x	2.5	x					x	
10	24R	5	198.6	2	x			x			x	2	x		x			x	
10	25R	1	200.6	1.5	x			x				2	x		x			x	
10	25R	2	202.1	2	x	x						2	x		x			x	
11	26R	1	210.2	2	x		x	x				3					x		
11	26R	2	211.6	2	x			x			x	3			x			x	
11	26R	3	213.03	2	x			x			x	2	x		x			x	
11	27R	1	219.8	2	x		x				x	2	x		x			x	
11	27R	2	221.27	2	x						x	2	x	x	x			x	x
11	28R	1	224	1.5	x			x			x	2					x		
11	29R	1	229.6	2	x			x			x	2	x		x			x	
11	29R	2	231.1	1			x	x			x	2					x	x	
11	29R	3	232.47	2			x	x			x	2					x	x	
11	30R	1	239.3	1			x	x			x	1.5					x		
11	30R	2	240.7	1							x	0.5						x	
13	31R	1	248.9	1.5	x						x	1.5	x			x		x	x
14	32R	2	260	1.5	x						x	2	x		x		x	x	
14	32R	3	261.5	1.5	x						x	2	x		x		x	x	
14	33R	1	268.1	2	x	x		x				1.5	x		x				
17	36R	3	289.01	3	x	x		x				2	x		x				
17	36R	4	290.51	3	x	x		x				2	x		x				
17	37R	1	291.9	3	x	x		x				2	x		x				
17	37R	2	292.91	2.5	x	x		x			x	2	x		x			x	
17	37R	3	294.41	1.5	x			x			x	2			x			x	
17	37R	4	295.91	2	x	x		x			x	2	x		x			x	
17	38R	1	296.9	1						x	x	1	x				x		
17	38R	2	297.81	2.5	x	x		x		x		1	x				x		
17	38R	3	298.54	1	x			x				1	x		x				
17	38R	4	300.04	1	x			x				1	x		x				
17	38R	5	301.45	1	x			x				1	x		x				
17	39R	1	301.5	2	x			x		x		1			x				
17	39R	2	302.29	2	x							1			x			x	
17	39R	3	303.79	2	x			x				1			x			x	
17	39R	4	305.12	2	x			x				1			x			x	
17	40R	1	306.5	2.5	x			x				1			x				
18B	40R	4	309.88	1	x			x			x	2						x	
18B	41R	1	311.1	2	x			x			x	2	x		x		x	x	x
18B	41R	2	312.57	2	x			x			x	2	x		x		x	x	x
21	41R	3	314.04	2.5	x			x			x	1					x	x	
21	41R	4	315.54	2.5	x			x			x	1					x	x	
21	42R	1	316.1	1	x							1						x	x
21	42R	2	317.27	1	x						x	1						x	x
21	42R	3	318.64	1	x						x	1						x	x
21	43R	1	320.6	1.5	x			x			x	2					x	x	
21	43R	2	322.1	1	x			x		x	x	1			x		x	x	
21	44R	1	323.2	1	x			x		x	x	2			x		x	x	
21	44R	2	324.7	1	x			x		x	x	2			x		x	x	
21	45R	1	329.5	0.5				x	x			2			x				
21	45R	2	331	0.5				x	x			2			x				

Hole 1206A **Vein Log**

Core	Sec	Section Top (mbsf)	CaCO3	Zeol	FeOX	GC	Cel	Brn C
2R	2	58.23		x				
3R	2	59.90	x		x			
3R	3	61.35			x			
3R	4	62.83	x		x			
3R	5	64.33	x		x			
4R	1	66.10	x					
4R	2	67.48	x					
4R	4	70.29	x		x	x		
4R	5	71.70	x		x	x		
6R	2	81.30		x		x		
7R	3	87.65	x					
7R	4	89.01	x					
8R	1	90.40	x					
9R	2	96.20	x				x	
14R	1	123.60				x		
14R	2	125.10	x			x		
15R	1	128.20	x					
16R	1	133.20	x			x		
16R	3	135.99	x					
16R	4	137.49	x					
16R	5	138.94	x					
17R	1	142.80	x		x			
19R	1	153.80	x			x		
19R	2	155.30	x		x			
20R	1	162.20	x			x		x
20R	4	166.53	x					
21R	5	177.73	x					
22R	1	181.40	x		x			
22R	2	182.89	x					
22R	3	184.39				x		
24R	1	192.70					x	
24R	3	195.70				x		
24R	4	197.13	x					
25R	1	200.60	x			x		
25R	2	202.10	x					
26R	1	210.20	x				x	
27R	1	219.80	x			x		
28R	1	224.00	x				x	
29R	1	229.60	x					
29R	2	231.10	x				x	
29R	3	232.47	x				x	
30R	1	239.30	x				x	
30R	2	240.70	x					
31R	1	248.90	x					
32R	2	260.00				x		
32R	3	261.50				x		
33R	1	268.10	x			x		
37R	3	294.41	x					
37R	4	295.91	x					
38R	4	300.04				x		
38R	5	301.45				x		
39R	1	301.50	x					
39R	2	302.29		x		x		
40R	1	306.50	x			x		
42R	2	317.27		x		x		
42R	3	318.64		x		x		
43R	1	320.60		x			x	