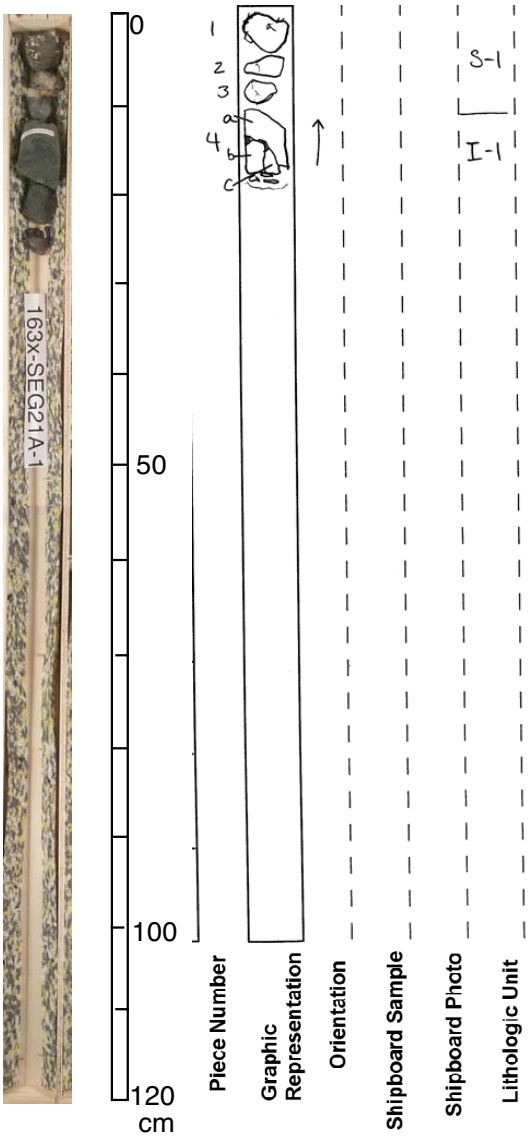
Core Photo

ODP LEG 163X UNIT SUMMARIES **163X-SEG21A-1-1, 0-8**

Transect EG65
Interval 0 - 8 cm **Depth Interval** 0-.08 mbsf
Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

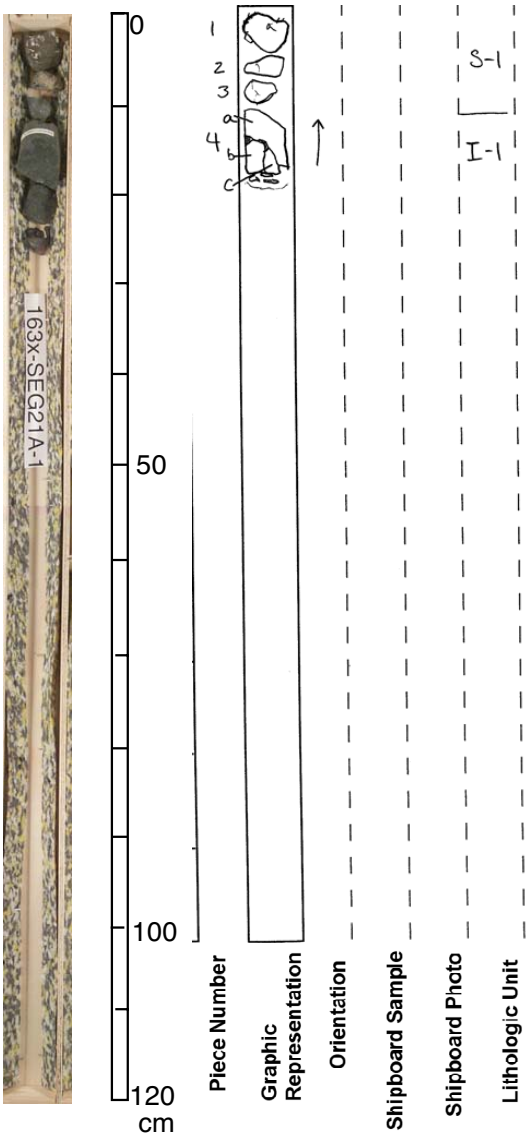
Pebble-sized, angular to subrounded, basaltic fragments (2-5 cm). Weathered surfaces occur on some fragments (Pieces 2 and 3) and living barnacles on another (Piece 1).

Core Photo

ODP LEG 163X UNIT SUMMARIES **163X-SEG21A-1-1, 8-18**

Transect EG65
Interval 8 - 18 cm **Depth Interval** .08-.18 mbsf
Unit I-1

Rock sparsely clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	<1	<1
clinopyroxene	2	0.5-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass fine-grained intergranular

Vesicles Top fractured surface has numerous irregular whitish patches (0.5-2 cm) which could be felsic segregations. On Piece 2A at about 10 cm there is a patch of tiny vugs.

Color grey green

Structure massive

Alteration slightly (2-10%)

Vein/fracture Fracture surfaces, including conjugate sets that are not mineralized, except for at the base of 2A, which is partly covered in a translucent mineral (not calcite) with slickenside.

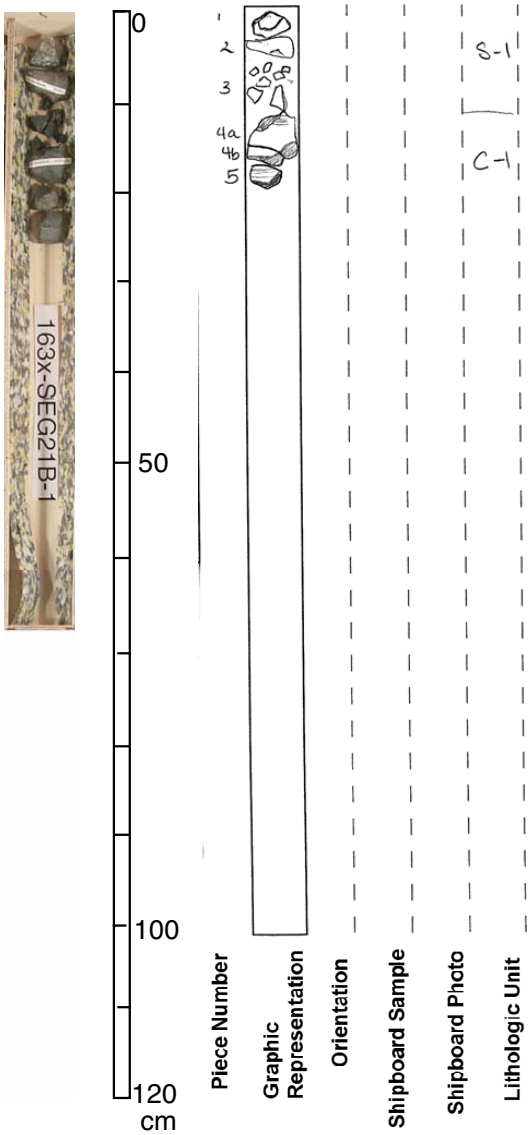
Unit Summary

Fine-grained, sparsely clinopyroxene-plagioclase phyric and porous basalt. Whitish patches that may be felsic segregations occur on top of Piece 2. Conjugate fracturing and slickenside are developed.

Core Photo

ODP LEG 163X UNIT SUMMARIES **163X-SEG21B-1-1, 0-10.5**

Transect EG65
Interval 0 - 10.5 cm **Depth Interval** 0-.105 mbsf
Unit S-1
Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Various pebble-sized clasts, including granite gneiss (Piece 1) and basalt (Pieces 2 to 5). The shapes of the clasts range from subrounded to very angular.

Core Photo

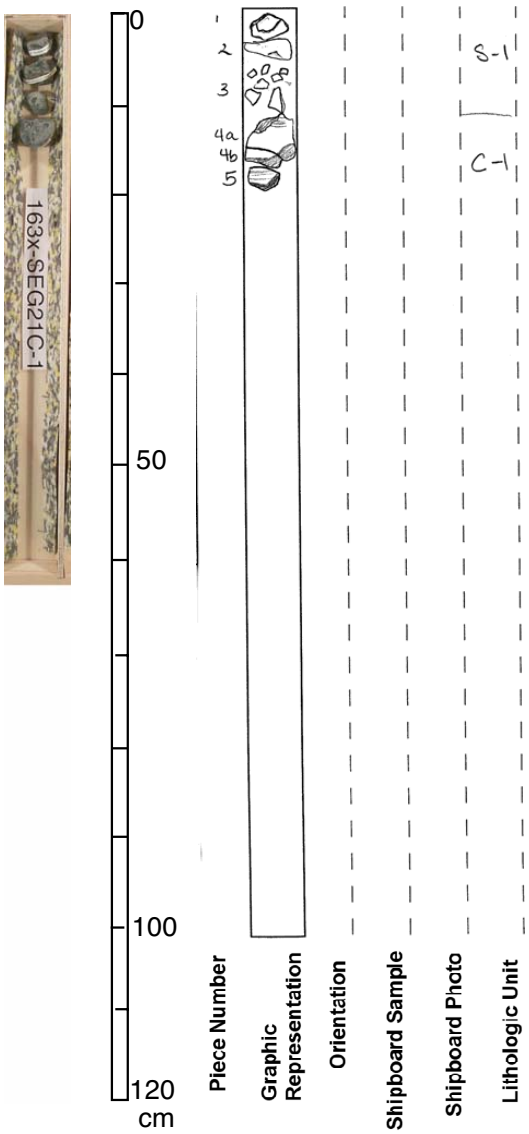
ODP LEG 163X UNIT SUMMARIES **163X-SEG21B-1-1, 10.5-19**

Transect EG65

Interval 10.5 - 19 cm **Depth Interval** .105-.19 mbsf

Unit C-1

Rock moderately clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	3	1-2

Phenocrysts	Shape	Alteration %
clinopyroxene	subhedral	

Groundmass

Vesicles

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, moderately clinopyroxene phyric and glomerophyric basaltic clasts.

Core Photo

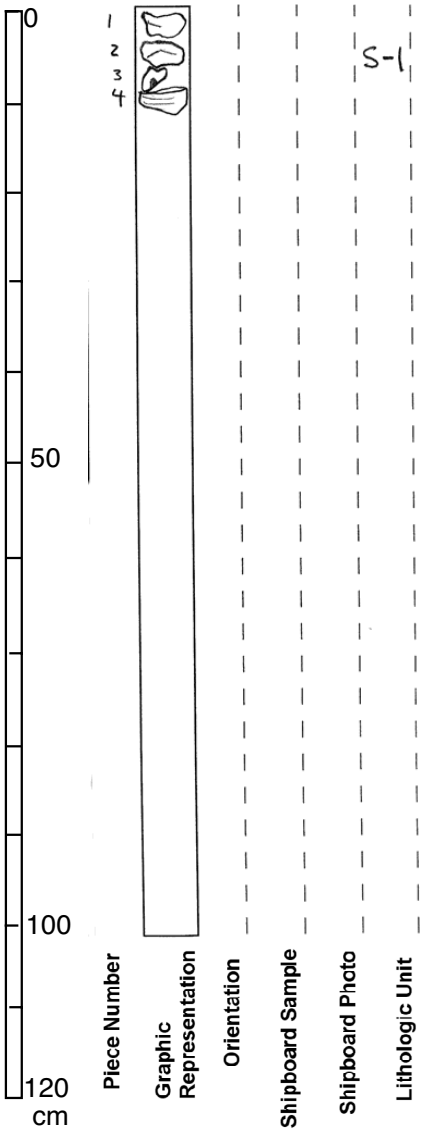
ODP LEG 163X UNIT SUMMARIES **163X-SEG21C-1-1, 0-12**

Transect EG65

Interval 0 - 12 cm **Depth Interval** 0-.12 mbsf

Unit S-1

Rock aphyric basaltic gravel



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color dark grey

Structure massive

Alteration

Vein/fracture

Unit Summary

Rounded basaltic clasts.

Core Photo

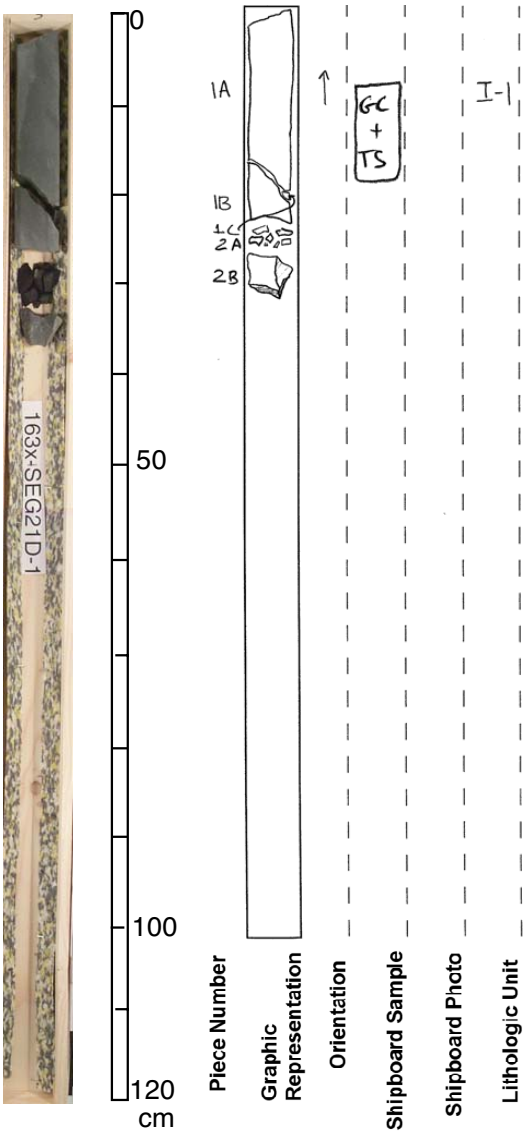
ODP LEG 163X UNIT SUMMARIES **163X-SEG21D-1-1, 0-31**

Transect EG65

Interval 0 - 31 cm **Depth Interval** 0-.31 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	1	1
clinopyroxene	3	1-3

Phenocrysts	Shape	Alteration %
plagioclase	laths	
clinopyroxene	subhedral	

Groundmass Intergraunlar groundmass composed of olivine, clinopyroxene and plagioclase.

Vesicles none

Color dark grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Lower segment, Piece 2, is highly fractured.

Unit Summary

Fine-grained, clinopyroxene-plagioclase phyric and glomerophyric basalt. Highly fractured in lowermost Piece 2.

Core Photo

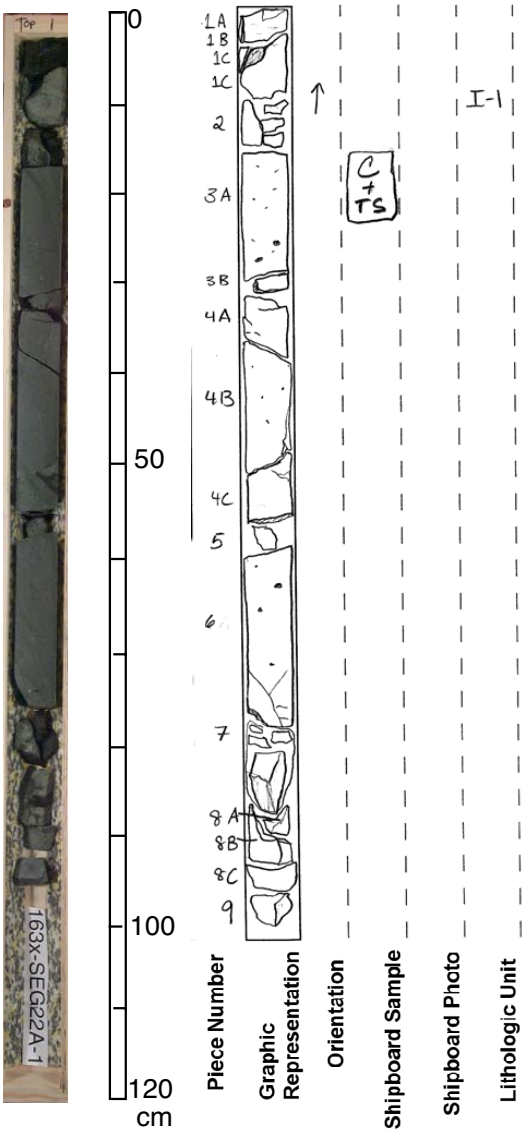
ODP LEG 163X UNIT SUMMARIES **163X-SEG22A-1-1, 0-98**

Transect EG65

Interval 0 - 98 cm **Depth Interval** 0-.98 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	4	2
plagioclase	1	0.5-3
clinopyroxene	4	0.5-2

Phenocrysts	Shape	Alteration %
olivine	euhedral	100
plagioclase	laths	
clinopyroxene	subhedral	

Groundmass Composed of plagioclase, augite, and olivine.

Vesicles Occassional filled vesicles 1-2 mm in size, generally rounded. Variably filled with white mineral (not calcite), translucent, green mineral and in Piece 6 (69 mm), a translucent pale brown cubic mineral.

Color grey green

Structure massive

Alteration slightly (2-10%)

Vein/fracture Fractures throughout core, but particularly marked in top 14.5 cm (pieces 1 and 2) and bottem 76.5-98 cm (pieces 7-9). Unmineralized.

Unit Summary

Fine-grained, amygdaloidal, moderately clinopyroxene-plagioclase-olivine phyric to glomerophyric basalt. Highly fractured at top and bottom of cored interval.

Core Photo

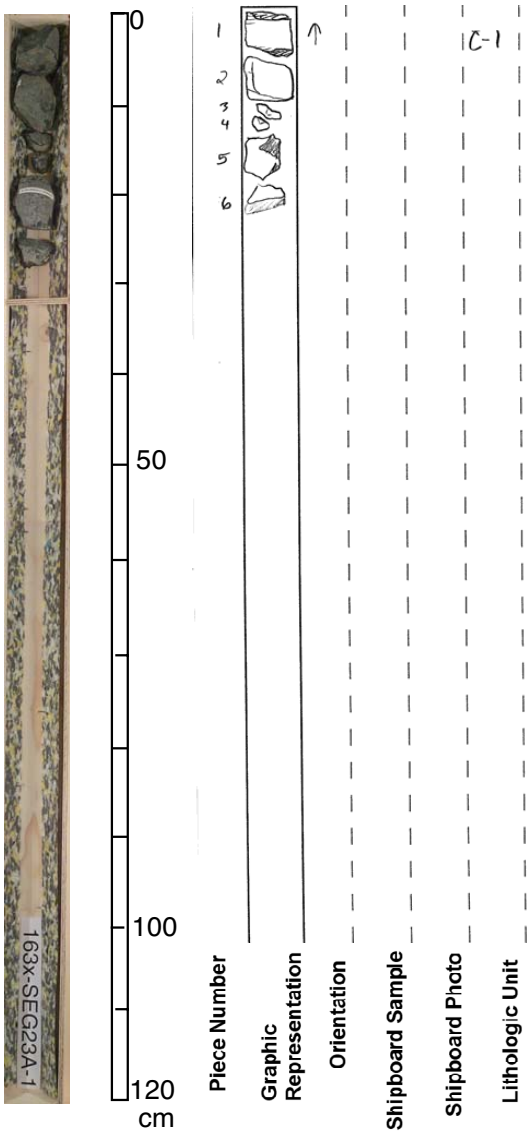
ODP LEG 163X UNIT SUMMARIES **163X-SEG23A-1-1, 0-23**

Transect EG65

Interval 0 - 23 cm **Depth Interval** 0-.23 mbsf

Unit C-1

Rock moderately clinopyroxene-plagioclase-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	<1	1
plagioclase	1	1
clinopyroxene	5	1-2

Phenocrysts	Shape	Alteration %
olivine	euhedral	100
plagioclase	subhedral	
clinopyroxene	sunhedral	

Groundmass Contains augite and plagioclase in an intergrown texture.

Vesicles none

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Weathered surfaces indicate that the basalt was fractured.

Unit Summary

Fine- to medium-grained, clinopyroxene-plagioclase-olivine phyric to glomerophyric basalt. Weathered surfaces and fracturing are common.

Core Photo

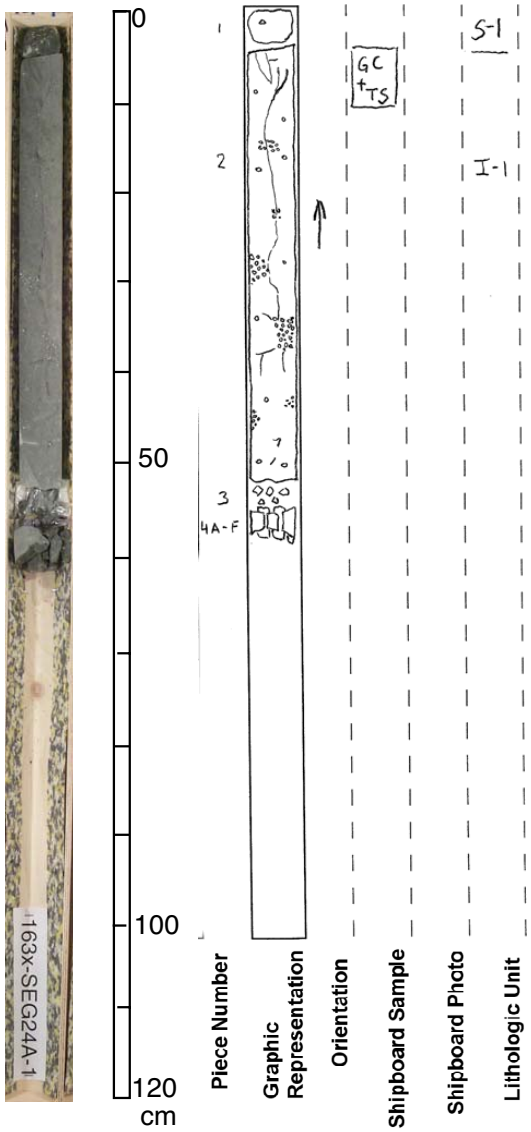
ODP LEG 163X UNIT SUMMARIES **163X-SEG24A-1-1, 0-4**

Transect EG65

Interval 0 - 4 cm **Depth Interval** 0-.04 mbsf

Unit S-1

Rock sparsely plagioclase-olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	1	<1
plagioclase	1	<1

Phenocrysts	Shape	Alteration %
olivine	subhedral	
plagioclase	subhedral	

Groundmass intergranular clinopyroxene and plagioclase

Vesicles

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Subangular clast composed of sparsely plagioclase-olivine phyric basalt.

Core Photo

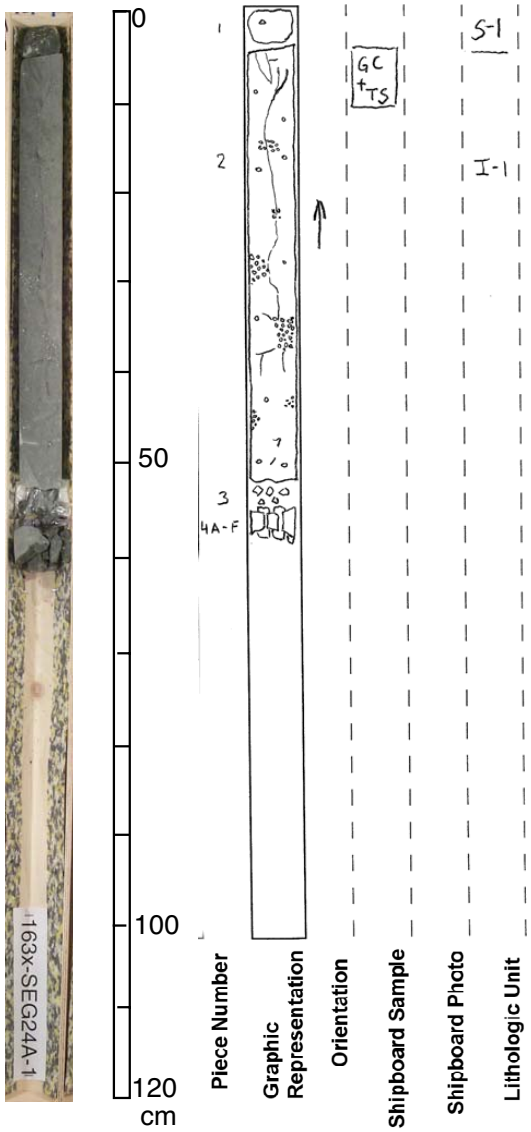
ODP LEG 163X UNIT SUMMARIES **163X-SEG24A-1-1, 4-57**

Transect EG65

Interval 4 - 57 cm **Depth Interval** .04-.57 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	5	1-2
plagioclase	>1	

Phenocrysts	Shape	Alteration %
clinopyroxene	subhedral	
plagioclase	subhedral	

Groundmass Fine-grained, intergranular and composed of plagioclase and clinopyroxene.

Vesicles Vesicles are irregular to round, filled with green or white minerals. Individual vesicles are 0.5 to 2 mm, but larger aggregated patches of vesicles are 1.5-2 cm in diameter.

Color light grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Fractures are <0.5 mm wide and mostly unfilled, but some are filled with white carbonate-free mineral mixtures. Fractures are mainly subparallel to length of core.

Unit Summary

Fine-grained, amygdaloidal, moderately clinopyroxene-plagioclase phyric basalt. Vesicles are irregular to round and filled with green or white minerals. Fractures are <0.5 mm wide and mostly unfilled. The contact to the overlying sedimentary Unit S-1 is not preserved.

Core Photo

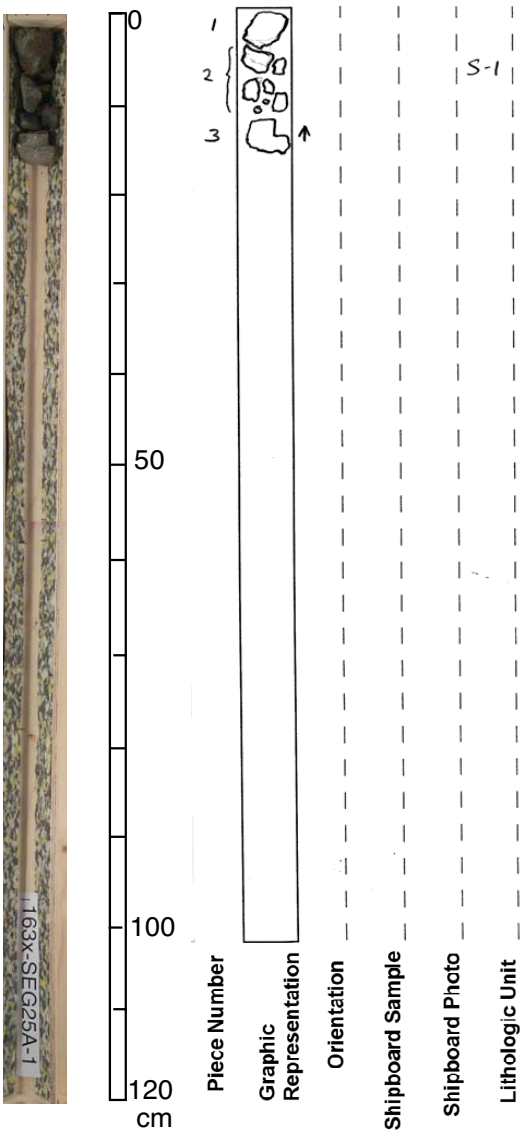
ODP LEG 163X UNIT SUMMARIES **163X-SEG25A-1-1, 0-15**

Transect EG65

Interval 0 - 15 cm **Depth Interval** 0-.15 mbsf

Unit S-1

Rock aphyric basaltic gravel



Phenocrysts	**Modal %**	**Size mm**

Phenocrysts	**Shape**	**Alteration %**

Groundmass

Vesicles Vesicles are filled with white, red, and bluish minerals.

Color dark grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Large subangular pebble-sized (2-5 cm) amygdaloidal, basaltic clasts with interstitial reddish brown mud.

Core Photo

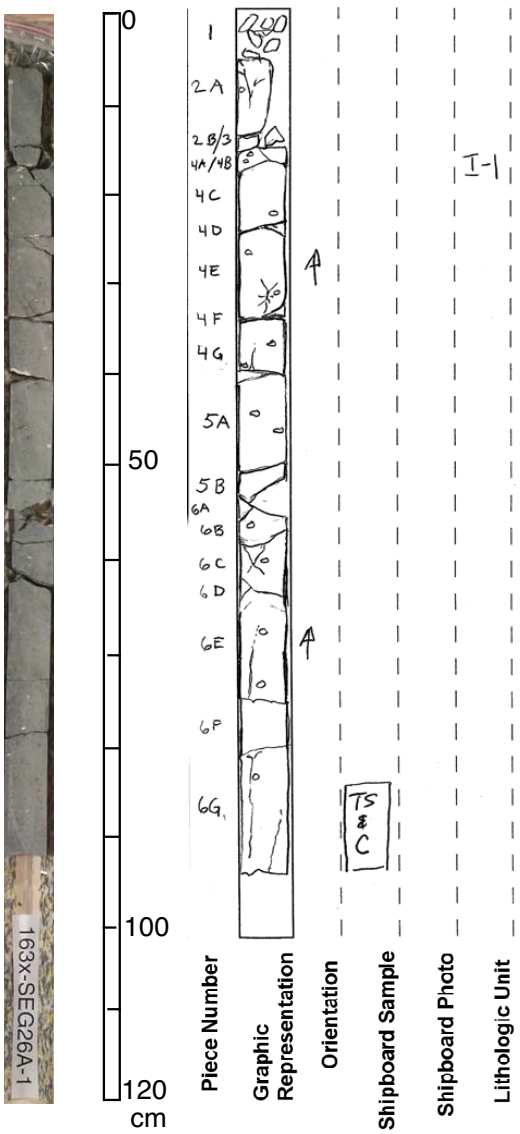
ODP LEG 163X UNIT SUMMARIES **163X-SEG26A-1-1, 0-92**

Transect EG65

Interval 0 - 92 cm **Depth Interval** 0-.92 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	2	1
clinopyroxene	5	1-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	sub-euhedral	30%

Groundmass Intergraunlar and mainly clinopyroxene and plagioclase.

Vesicles Vesicle sizes are 1-5 mm and are filled by a white material.

Color light grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Veins are less than 1 mm wide and filled with white minerals. Most fractures are at right angles to core length.

Unit Summary

Fine-grained, clinopyroxene-plagioclase phyric, light grey basalt with some glomerocrysts of clinopyroxene and plagioclase. Most clinopyroxenes occur as discrete phenocrysts. The basalt has 1 to 5 mm large amygdules and small veins <1 mm wide, all with white fillings. There is extensive fracturing at nearly 90 degrees to core axis, and the basalt is moderately altered.

Core Photo

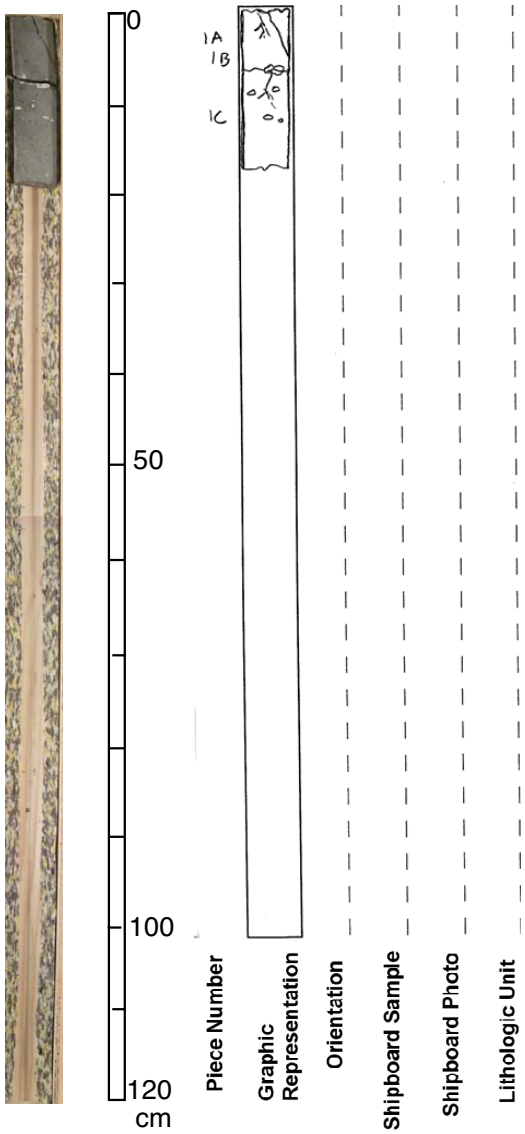
ODP LEG 163X UNIT SUMMARIES **163X-SEG26A-1-2, 0-18**

Transect EG65

Interval 0 - 18 cm **Depth Interval** 0-.18 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	2	1
clinopyroxene	5	1-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	subhedral-euhedral	30%

Groundmass intergraunlar with mainly clinopyroxene and plagioclase

Vesicles Vesicle sizes are 1-5 mm and are filled by a white material.

Color light grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Veins are less than 1 mm wide and filled with white minerals. Most fractures are at right angles to core length.

Unit Summary

Fine-grained, clinopyroxene-plagioclase phyric, light gray basalt with some glomerocrysts of clinopyroxene and plagioclase. Most clinopyroxenes occur as discrete phenocrysts. The basalt has 1 to 5 mm large amygdules and small veins <1 mm wide, all with white fillings. There is extensive fracturing at nearly 90 degrees to core axis, and the basalt is moderately altered.

Core Photo

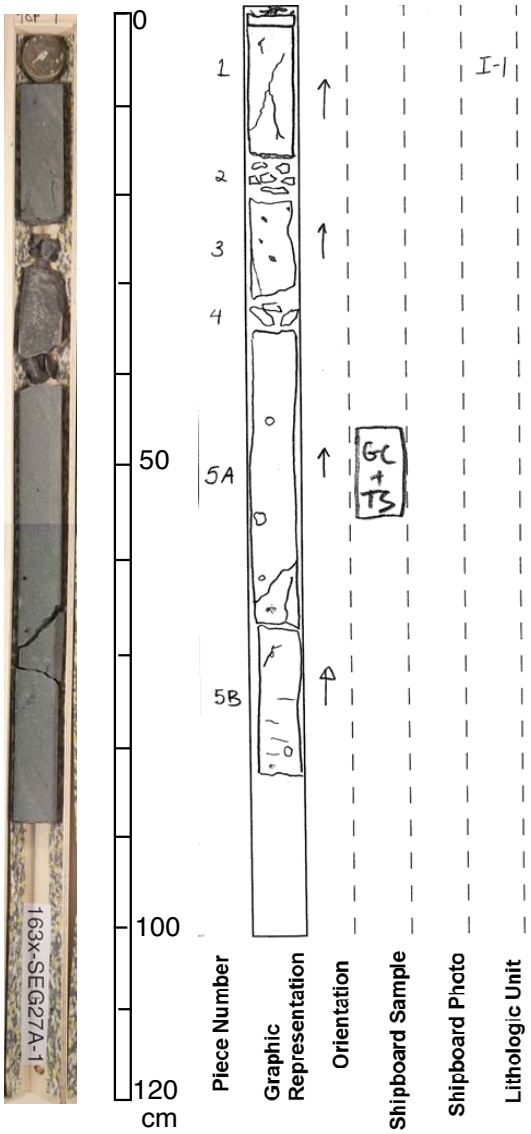
ODP LEG 163X UNIT SUMMARIES **163X-SEG27A-1-1, 0-82**

Transect EG65

Interval 0 - 82 cm **Depth Interval** 0-.82 mbsf

Unit I-1

Rock highly plagioclase-clinopyroxene phyric olivine-basalt



Phenocrysts	Modal %	Size mm
plagioclase	15	1-3
clinopyroxene	4	0.5-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	20
clinopyroxene	subhedral	20

Groundmass Composed mainly of plagioclase, clinopyroxene and olivine.

Vesicles Numerous flattened, large, irregular vesicles 0.5-5 mm in diameter, unfilled except for occassional thin, whitish coating. Occassional patches of small, about 2 cm, unfilled vesicles (1-3 mm).

Color grey green

Structure massive

Alteration slightly (2-10%)

Vein/fracture Variably fractured, irregular with no infilling

Unit Summary

Fine-grained, greenish-grey plagioclase-clinopyroxene phyric and vesicular basalt containing abundant large (0.5 to 5 cm), open vesicles with thin whitish coating. Occassional 1 to 3 cm large patches of small (ca 2 mm) unfilled vesicles. There are also numerous small, about 1-2 mm round, unfilled vesicles with pale turquoise green clays. Several 2-3 cm wide bands of vesicles are inclined at nearly 90 degrees to the core axis. Possible irregular tube vesicles in Piece 5A are oriented subparallel to core axis. The basalt is slightly altered. There was live coral growing on top of the core, indicating that the top of the unit was seabed.

Core Photo

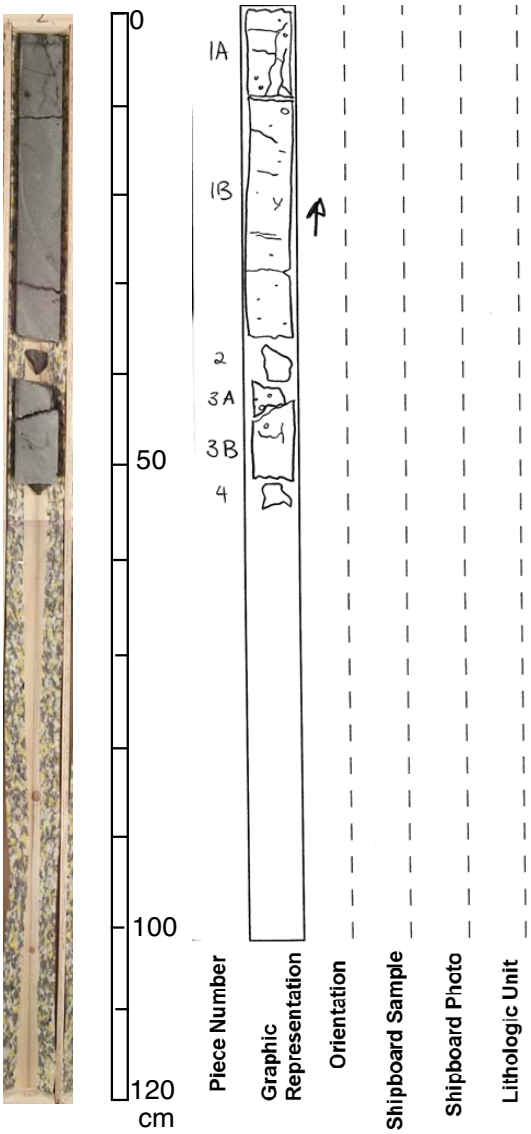
ODP LEG 163X UNIT SUMMARIES **163X-SEG27A-1-2, 0-49**

Transect EG65

Interval 0 - 49 cm **Depth Interval** 0-.49 mbsf

Unit I-1

Rock highly plagioclase-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	15	1-3
clinopyroxene	4	0.5-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	20
clinopyroxene	subhedral	20

Groundmass Composed mainly of plagioclase, clinopyroxene, and olivine.

Vesicles

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, greenish-grey plagioclase-clinopyroxene phyric and vesicular basalt containing abundant large open vesicles with thin whitish coating. Continued from Section SEG27A-1-2.

Core Photo

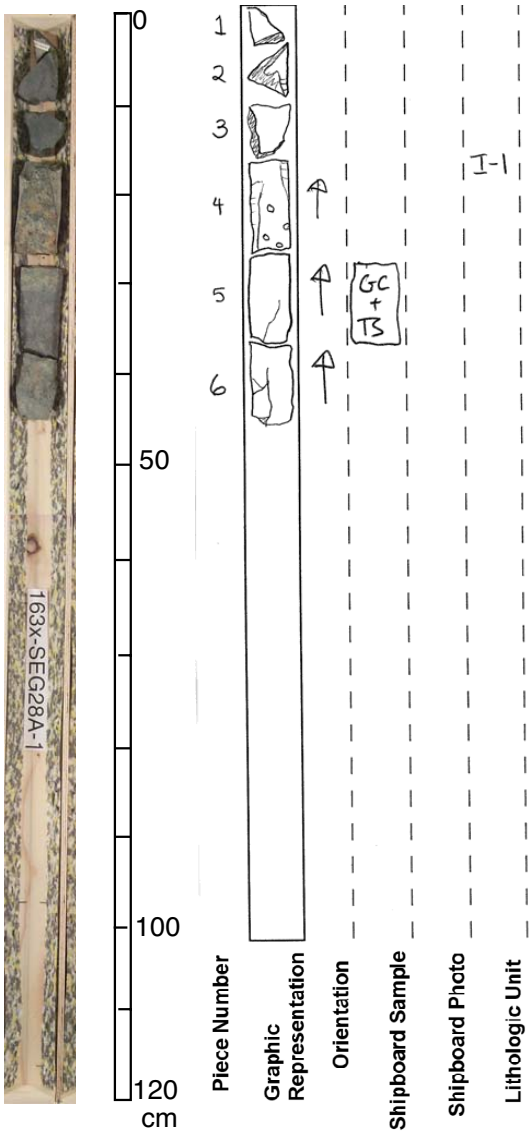
ODP LEG 163X UNIT SUMMARIES **163X-SEG28A-1-1, 0-48**

Transect EG65

Interval 0 - 48 cm **Depth Interval** 0-.48 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	3	1
clinopyroxene	5	1-2

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of clinopyroxene, plagioclase, and mesostasis (altered to green clay).

Vesicles Some vesicles are unfilled, others are filled with pale green clays, 1-3 mm in diameter.

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Fractures have brown alteration or weathering along the surfaces. Notable are the vertical fractures in Pieces 4-5 and also along the base of Piece 4.

Unit Summary

Fine-grained, moderately clinopyroxene-plagioclase porphyritic to glomeroporphyritic and vesicular to amygdaloidal basalt. Vesicles are 1-3 mm in diameter, some are unfilled, others have fillings of pale green clays. The basalt is moderately altered.

Core Photo

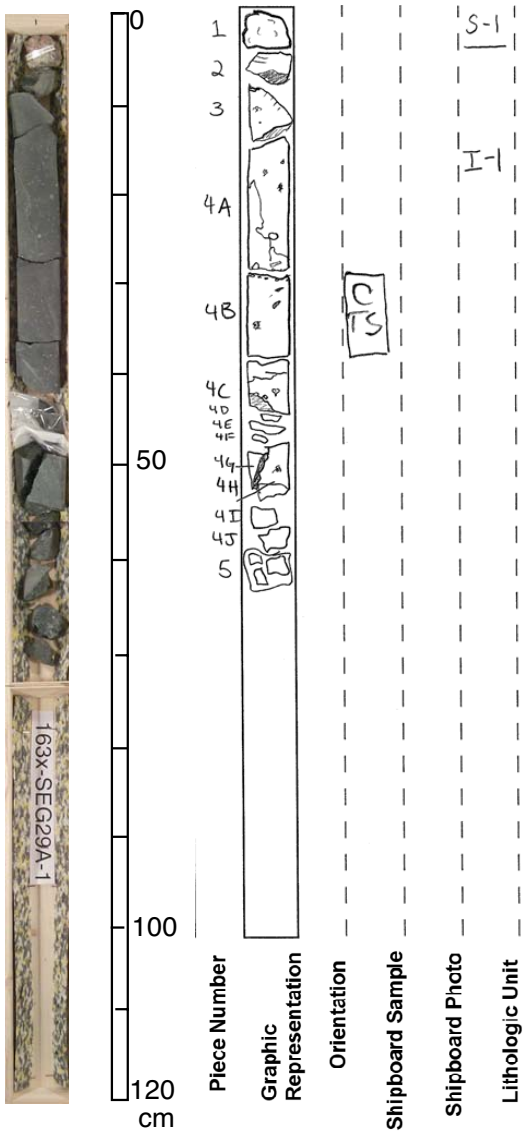
ODP LEG 163X UNIT SUMMARIES **163X-SEG29A-1-1, 0-5**

Transect EG65

Interval 0 - 5 cm **Depth Interval** 0-.05 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Rounded granite clast.

Core Photo

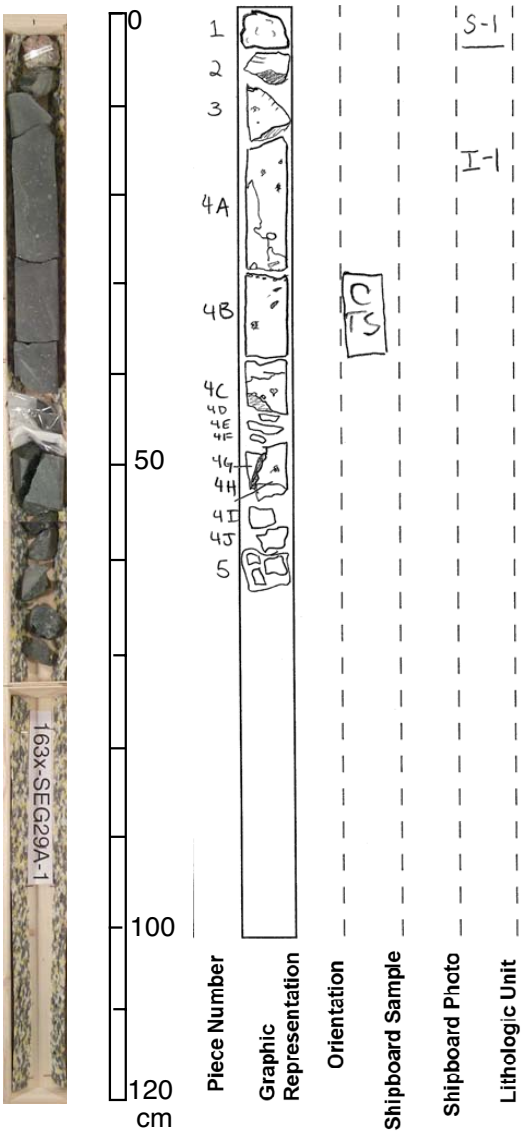
ODP LEG 163X UNIT SUMMARIES **163X-SEG29A-1-1, 5-59**

Transect EG65

Interval 5 - 59 cm **Depth Interval** .05-.59 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase-olivine phyric olivine-basalt



Phenocrysts	Modal %	Size mm
olivine	<1	1
plagioclase	2	1
clinopyroxene	6	1-3

Phenocrysts	Shape	Alteration %
olivine	euhedral-prismatic	100
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Intergranular plagioclase, clinopyroxene, olivine (present in the highest amount).

Vesicles There are unfilled vesicles, 1-4 mm as well as amygdules, 1-6 mm in diameter. Vesicles tend to be very round. Amygdules filled with clay as well as a white mineral.

Color dark grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Irregular fractures throughout core that are unfilled as well as filled. White mineral in center of many fractures is calcite. Fractures rimmed with copper colored mineral and translucent pale brown mineral with cubic habit, possibly chabazite.

Unit Summary

Fine-grained, moderately clinopyroxene-plagioclase-olivine phyric olivine basalt with glomerocrysts of plagioclase and clinopyroxene. The basalt is moderately altered and vesicular (vesicle diameters 1-4 mm) and amygdaloidal (amygdule diameters 1-6 mm), occassionnally with bands of amygdules. There are irregular fractures throughout the core, some mineralized with carbonate in central parts and rimmed with copper-colored and translucent clear brown minerals. Veins also contain quartz, native copper, and an unidentified gold-colored phase.

Core Photo

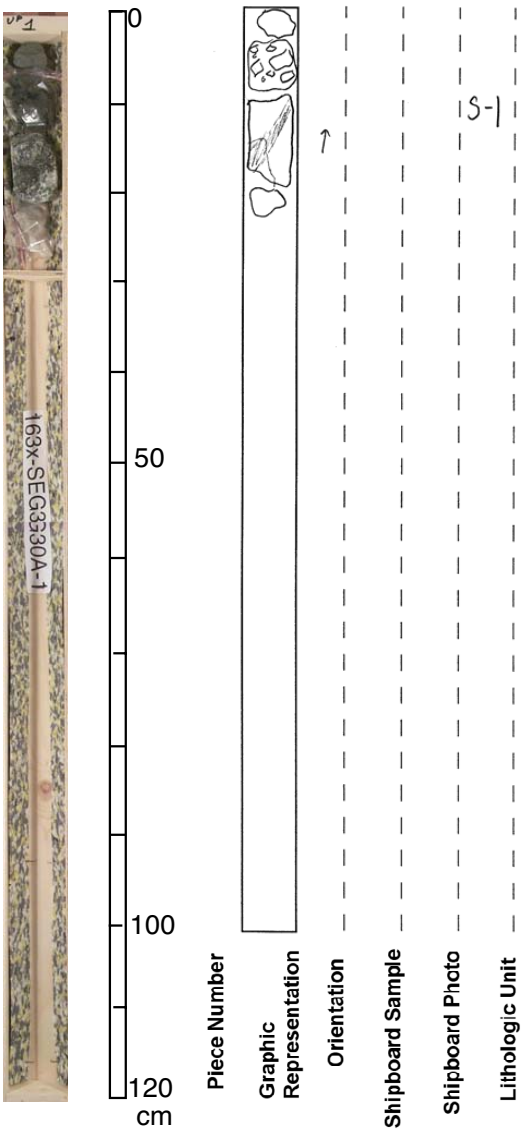
ODP LEG 163X UNIT SUMMARIES **163X-SEG30A-1-1, 0-23**

Transect EG65

Interval 0 - 23 cm **Depth Interval** 0-.23 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Clasts of basalt, well-rounded gneiss, and quartz.

Core Photo

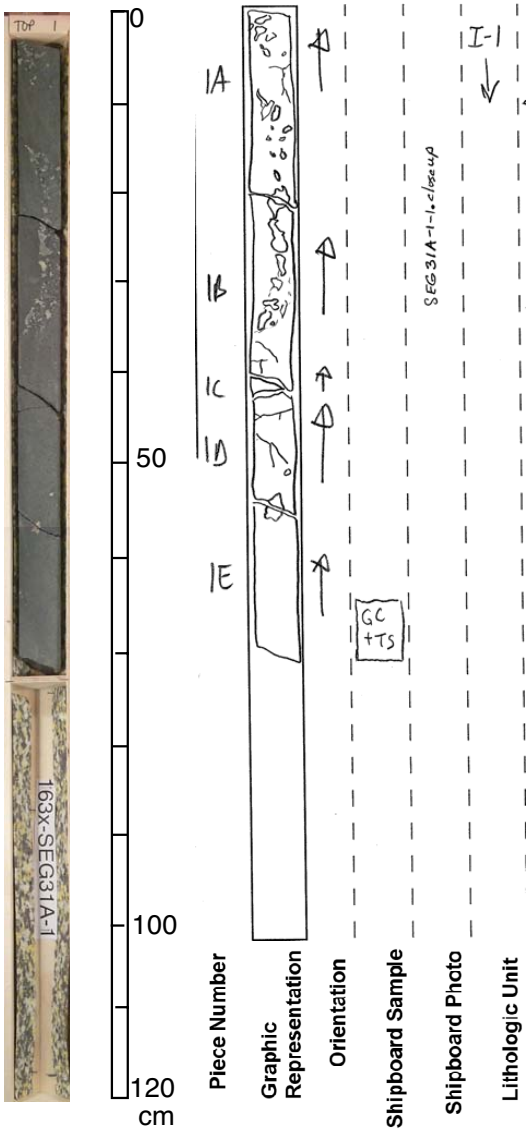
ODP LEG 163X UNIT SUMMARIES **163X-SEG31A-1-1, 0-69.5**

Transect EG65

Interval 0 - 69.5 cm **Depth Interval** 0-.695 mbsf

Unit I-1

Rock highly plagioclase-olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2-4	1-2
plagioclase	4	0.5-2
clinopyroxene	3	0.5-2

Phenocrysts	Shape	Alteration %
olivine	prismatic	100
plagioclase	subhedral-euhedral	
clinopyroxene	subhedral	

Groundmass

Vesicles Lower Pieces 1D and 1E contain large 0.5-1 cm subrounded vesicles filled with fibrous material (zeolite). In Pieces 1A and 1B occur a large (0-32 cm) subvertical segregation vesicular pipe with sharp contacts.

Color light grey green

Structure massive

Alteration slightly (2-10%)

Vein/fracture Irregular, consistently shallow inclinated, fractures bound all fragments and are lined with calcite. Numerous other irregular hairline fractures occur throughout core.

Unit Summary

Fine-grained, vesicular, moderately plagioclase-olivine-clinopyroxene phyric to glomerocrystic basalt. The proportion of olivine increases toward the bottom of the core. In Pieces 1A and 1B, occur a large (0-32 cm) segregation vesicular pipe, subparallel to core axis, and with sharp, but irregular boundaries. Vesicles within the pipe are 0.5-2 cm in diameter and with irregular shape.

Core Photo

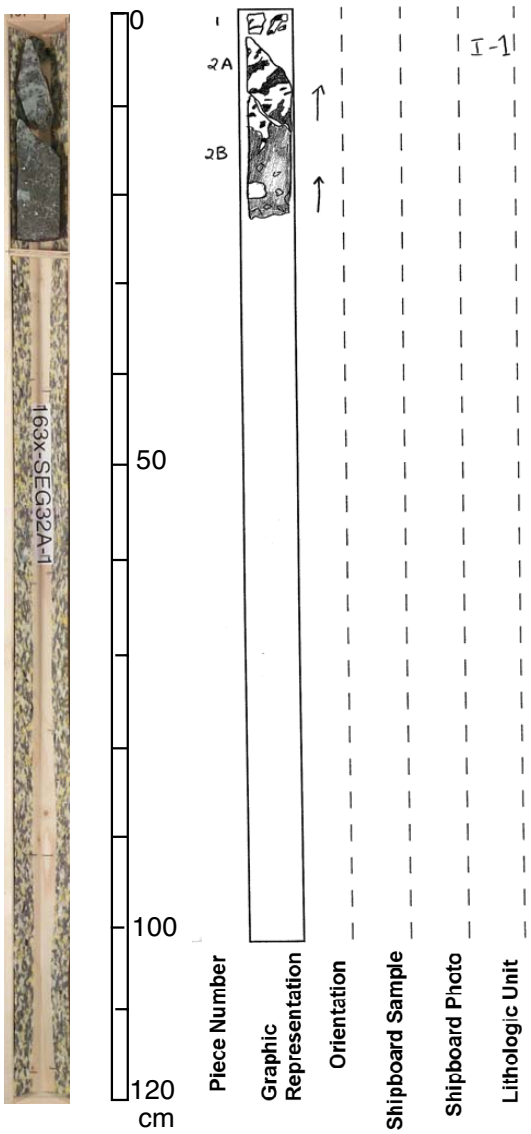
ODP LEG 163X UNIT SUMMARIES **163X-SEG32A-1-1, 0-23**

Transect EG65

Interval 0 - 23 cm **Depth Interval** 0-.23 mbsf

Unit I-1

Rock hornblende-biotite pegmatite



Phenocrysts	Modal %	Size mm
Hornblende	30	5
Biotite	30	5
Quartz	30	5

Phenocrysts	Shape	Alteration %
Hornblende	euhedral	0
Biotite	euhedral	0
Quartz	anhedral	0

Groundmass The primary minerology of this rock also include sphene (2 %, 2-3 mm).

Vesicles

Color black and light grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture No fractures.

Unit Summary

Hornblende-biotite pegmatite with interstitial sulfides.

Core Photo

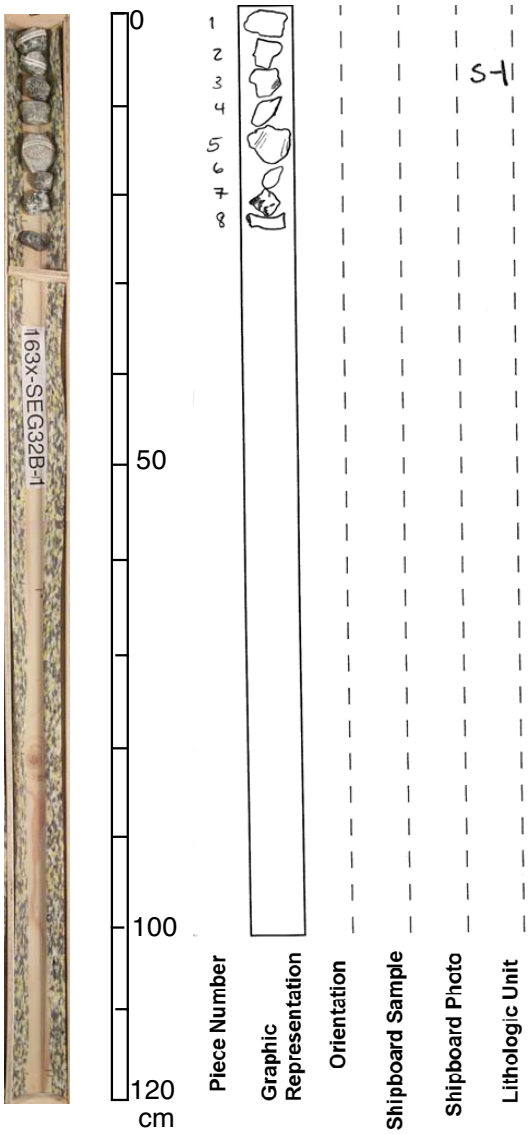
ODP LEG 163X UNIT SUMMARIES **163X-SEG32B-1-1, 0-22.5**

Transect EG65

Interval 0 - 22.5 cm **Depth Interval** 0-.225 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Clasts entirely composed of various felsic, mafic gneiss, and massive granite.

SEG33A-1 No recovery

SEG34A-1 No recovery

Core Photo

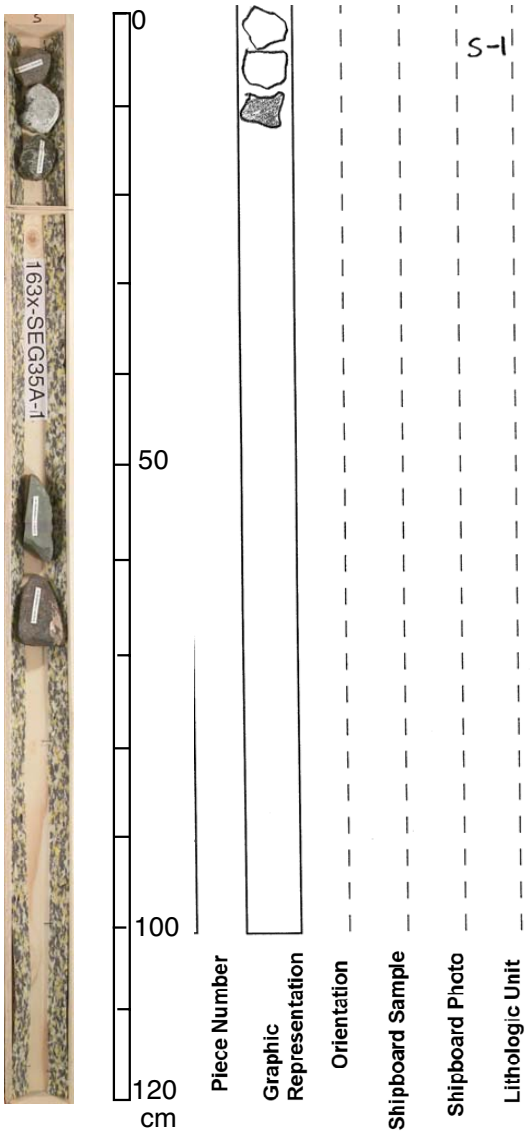
ODP LEG 163X UNIT SUMMARIES **163X-SEG35A-1-1, 0-13**

Transect EG65

Interval 0 - 13 cm **Depth Interval** 0-.13 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular to rounded pebbles of mafic and felsic gneiss and arkosic sandstone with silica cement. Two dropstones picked up with mud on the drill rig are included in bottom of Section 1 of core box.

Core Photo

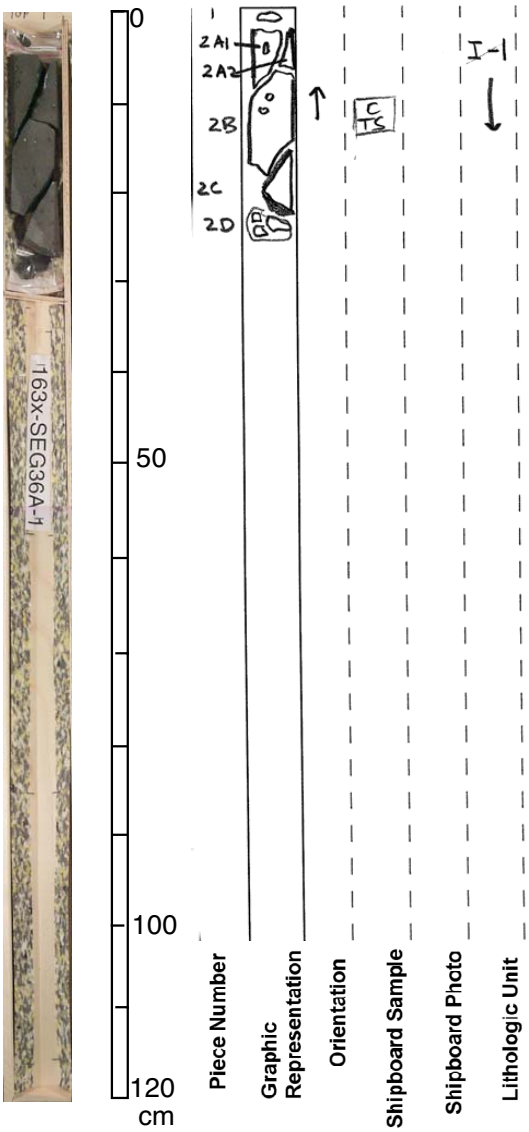
ODP LEG 163X UNIT SUMMARIES **163X-SEG36A-1-1, 0-25**

Transect EG65

Interval 0 - 25 cm **Depth Interval** 0-.25 mbsf

Unit I-1

Rock highly olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	10-15	0.5-2
clinopyroxene	3	0.5

Phenocrysts	Shape	Alteration %
olivine	prismatic-subhedral	100
clinopyroxene	euhedral	90

Groundmass Intergranular groundmass with olivine, plagioclase, and clinopyroxene.

Vesicles Numerous 5 mm sized, spherical vesicles filled with chlorite, albite, and calcite.

Color red brown

Structure massive

Alteration highly (40-80%)

Vein/fracture Fracturing at 20-30 degrees to the core axis; fractures partially filled with calcite.

Unit Summary

Fine-grained, amygdaloidal to vesicular, highly olivine-clinopyroxene phyric basalt. Spherical vesicles are filled with chlorite, albite, and calcite. The groundmass is highly silicified and olivine is completely altered to rusty red iddinsite. Fractures are partially filled with calcite.

Core Photo

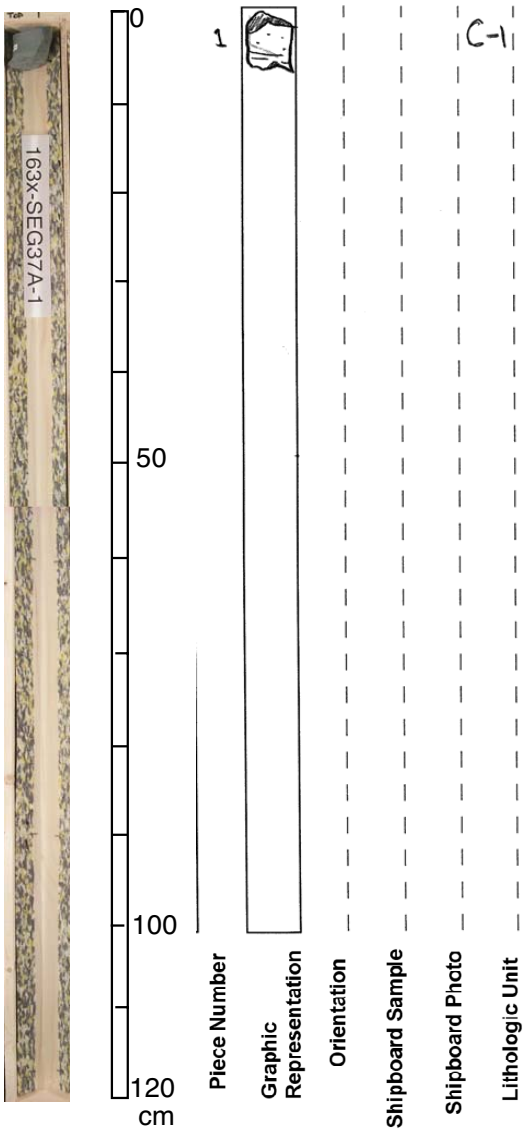
ODP LEG 163X UNIT SUMMARIES **163X-SEG37A-1-1, 0-6.5**

Transect EG65

Interval 0 - 6.5 cm **Depth Interval** 0-.065 mbsf

Unit C-1

Rock aphyric basalt



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color grey

Structure massive

Alteration highly (40-80%)

Vein/fracture

Unit Summary

Cored clast composed of aphyric basalt.

SEG38A-1 No recovery

Core Photo

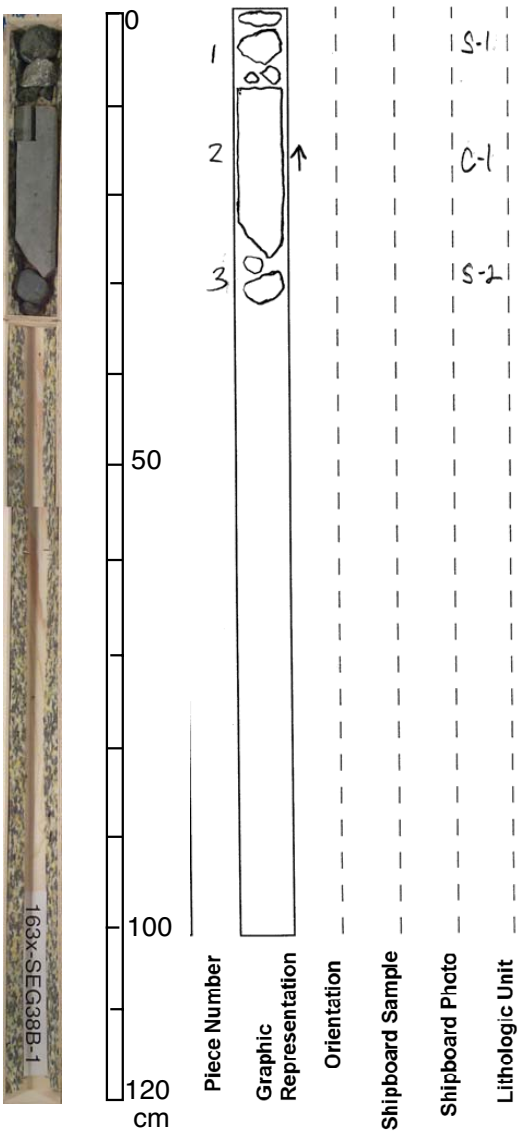
ODP LEG 163X UNIT SUMMARIES **163X-SEG38B-1-1, 0-8**

Transect EG65

Interval 0 - 8 cm **Depth Interval** 0-.08 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Coarse-grained fragments of unidentified rock with sizes from 1-4 cm

Core Photo

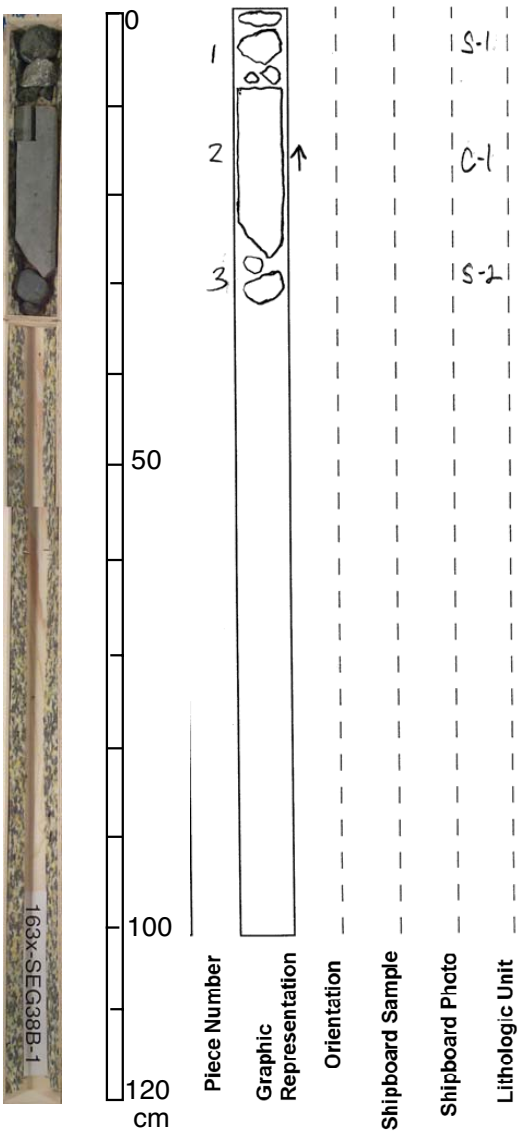
ODP LEG 163X UNIT SUMMARIES **163X-SEG38B-1-1, 8-27**

Transect EG65

Interval 8 - 27 cm **Depth Interval** .08-.27 mbsf

Unit C-1

Rock sandstone



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Gray volcaniclastic sandstone with dark clasts. At the bottem of unit are two dark gray basaltic fragments, one of them containing altered olivine. The sandstone mainly consists of quartz grains, but also contain mica, plagioclase, clinopyroxene, and glauconite (?). Quartz grains are subangular and cemented. Dark streaks may be organic material.

Core Photo

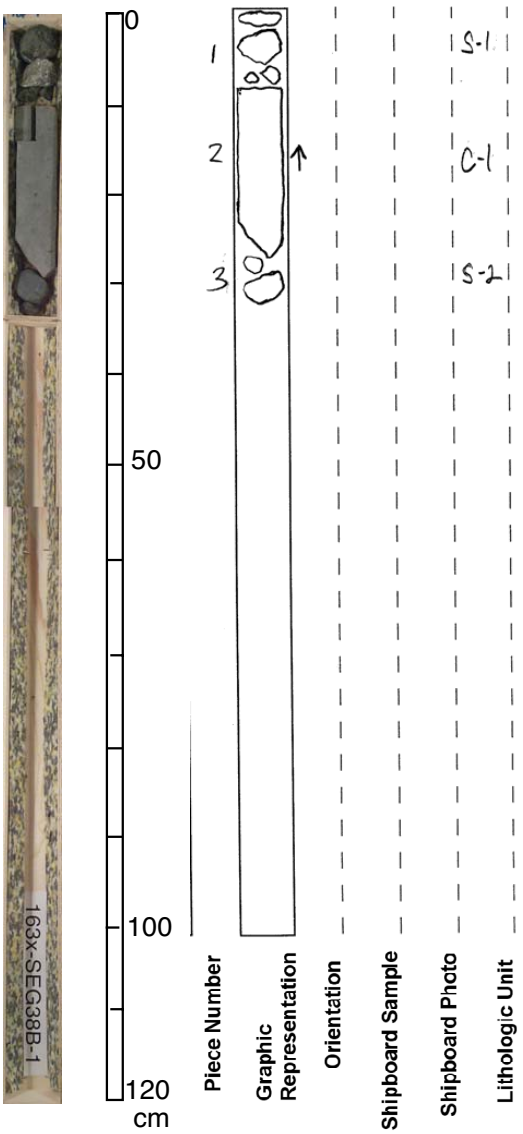
ODP LEG 163X UNIT SUMMARIES **163X-SEG38B-1-1, 27-32**

Transect EG65

Interval 27 - 32 cm **Depth Interval** .27-.32 mbsf

Unit S-2

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Basaltic fragments containing altered olivine.

Core Photo

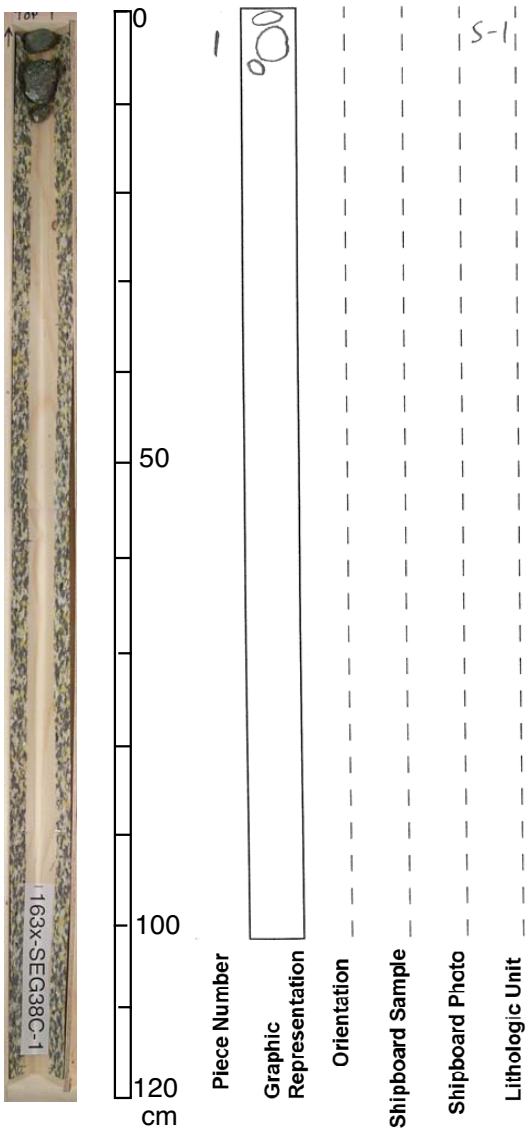
ODP LEG 163X UNIT SUMMARIES **163X-SEG38C-1-1, 0-7**

Transect EG65

Interval 0 - 7 cm **Depth Interval** 0-.07 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular, pebble-sized basaltic clasts of fine-grained, clinopyroxene phyric and highly altered, olivine phyric basalts.

Core Photo

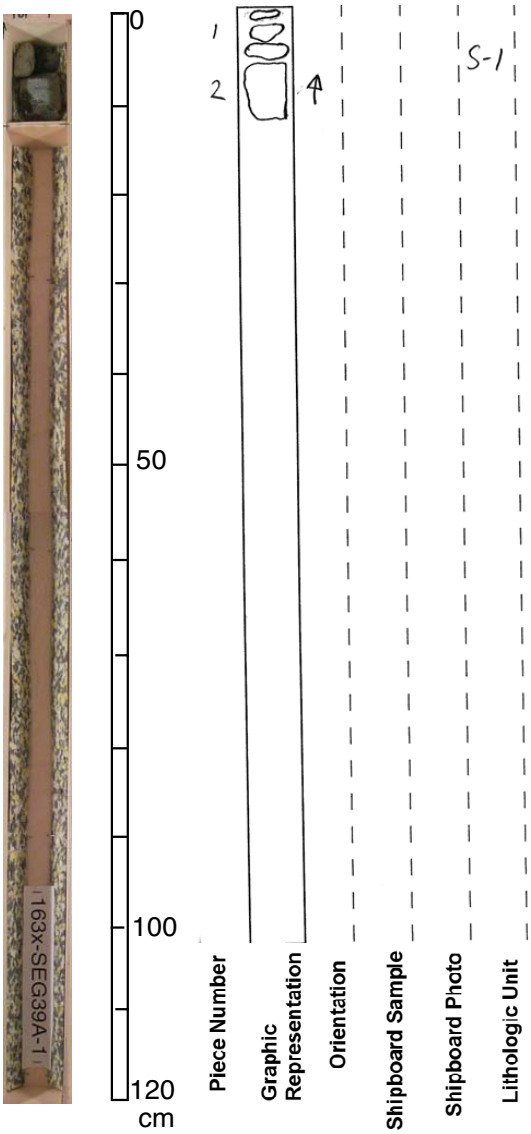
ODP LEG 163X UNIT SUMMARIES **163X-SEG39A-1-1, 0-11**

Transect EG65

Interval 0 - 11 cm **Depth Interval** 0-.11 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular to rounded clasts of basalts and sandstone, sizes from ca 1.5 to 6 cm. Piece 2 is a basaltic clast with striations on the bottom surface.

Core Photo

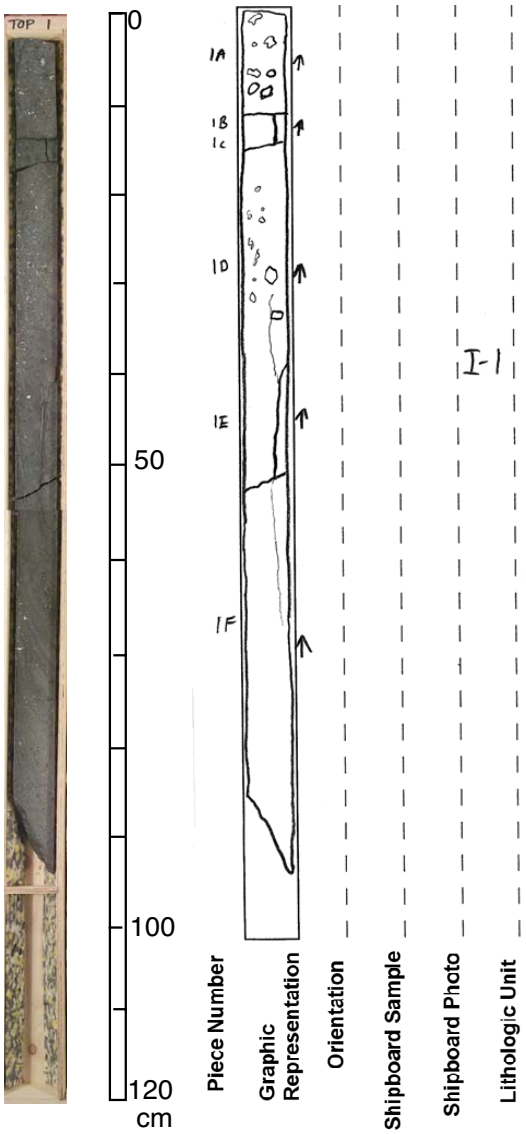
ODP LEG 163X UNIT SUMMARIES **163X-SEG40A-1-1, 0-88**

Transect EG65

Interval 0 - 88 cm **Depth Interval** 0-.88 mbsf

Unit I-1

Rock highly olivine phyric olivine-basalt



Phenocrysts	Modal %	Size mm
olivine	15	1-6
spinel	1	0.1

Phenocrysts	Shape	Alteration %
olivine	euhedral-subhedral	100
spinel	euhedral	

Groundmass Seriate textured groundmass with olivine, clinopyroxene, and plagioclase. Abundant spinels in olivine, especially olivine megacrysts.

Vesicles Amygdules filled with calcite, chlorite and quartz. Original vesicles flattened normal to core axis and subparallel to faint flow banding in bottem 15 cm of Section 2, Piece 1.

Color purple grey

Structure massive

Alteration highly (40-80%)

Vein/fracture Irregular fractures subparallel to core axis, filled with calcite.

Unit Summary

Fine-grained, highly olivine phyric and amygdaloidal olivine-basalt with few spinel phenocrysts. Olivine phenocrysts vary greatly in size, from about 1 mm to 1 cm, and they are completely altered to iddingsite and lizardite. Amygdules are filled with calcite, chlorite, and quartz. Original vesicles are flattened normal to core axis. The rock is highly silicified, highly altered, and irregular fractures subparallel to the core axis are filled with calcite. Copper alteration - much copper green tinge and native copper. Glacial striations on the top surface of core.

Core Photo

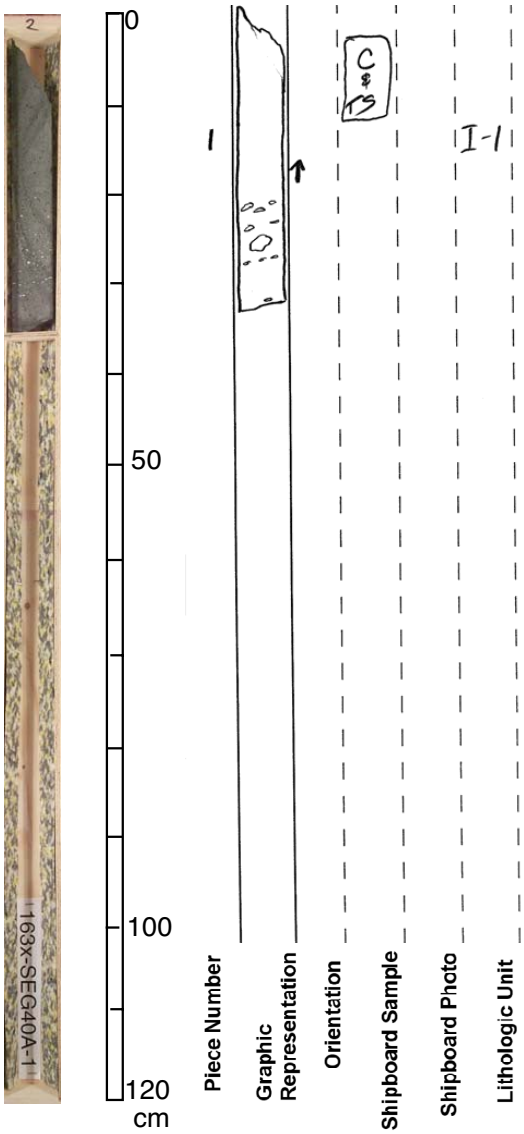
ODP LEG 163X UNIT SUMMARIES **163X-SEG40A-1-2, 4-33**

Transect EG65

Interval 4 - 33 cm **Depth Interval** .04-.33 mbsf

Unit I-1

Rock highly olivine phyric olivine-basalt



Phenocrysts	Modal %	Size mm
olivine	15	1-6
spinel	1	0.1

Phenocrysts	Shape	Alteration %
olivine	euhedral-subhedral	100
spinel	euhedral	

Groundmass Composed of olivine, clinopyroxene, and plagioclase. Seriate texture. Abundant spinels in olivines, especially megacrysts.

Vesicles Amygdules filled with calcite, chlorite and quartz. Original vesicles flattened normal to core axis and subparallel to faint flow banding in bottem 15 cm of Section 2, Piece 1.

Color purple grey

Structure massive

Alteration highly (40-80%)

Vein/fracture Irregular fractures subparallel to core axis, filled with calcite.

Unit Summary

Highly olivine-phyric and amygdaloidal olivine-basalt with few spinel microcrysts (< 1 vol. %). Olivine phenocrysts vary greatly in size, from about 1 mm to 1 cm, and they are completely altered to iddingsite and lizardite. Amygdales are filled with calcite, chlorite and quartz. Original vesicles are flattened normal to core axis and are subparallel to faint flow banding in the lower 15 cm of Piece 1. The rock is highly silicified, highly altered, and with irregular fractures subparallel to the core axis that are filled with calcite. Copper alteration - much copper green tinge and native copper.

Core Photo

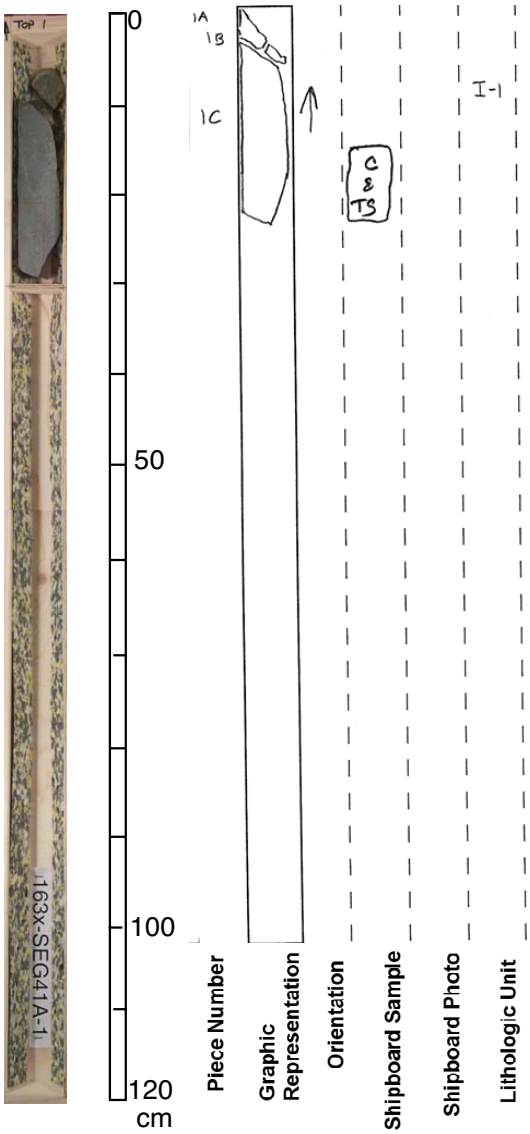
ODP LEG 163X UNIT SUMMARIES **163X-SEG41A-1-1, 0-23**

Transect EG65

Interval 0 - 23 cm **Depth Interval** 0-.23 mbsf

Unit I-1

Rock highly plagioclase-olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	4	1-2
plagioclase	5	1-2
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
plagioclase	subhedral	
clinopyroxene	subhedral	50

Groundmass

Vesicles Occassional subrounded vesicles, 1-3 mm, unfilled and filled with pale green clay mineral.

Color light grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture One inclined 45 degrees, unfilled fracture at the top of Piece 1C.

Unit Summary

Fine-grained, highly plagioclase-olivine-clinopyroxene phyric, massive basalt with most phenocrysts in glomerocrysts, although some prismatic olivine (altered to green clays) occur as discrete phenocrysts. Occasional vesicles of 1-3 mm diameter are filled with a pale green clay mineral, although some are unfilled. The basalt is fresh.

Core Photo

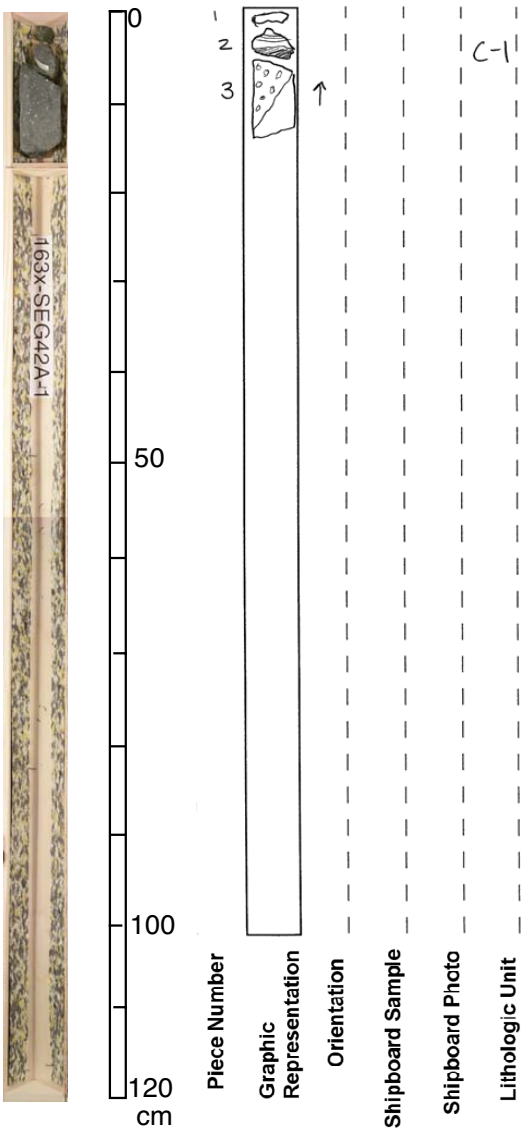
ODP LEG 163X UNIT SUMMARIES **163X-SEG42A-1-1, 0-15**

Transect EG65

Interval 0 - 15 cm **Depth Interval** 0-.15 mbsf

Unit C-1

Rock highly olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	13	1-3
clinopyroxene	5	1-2

Phenocrysts	Shape	Alteration %
olivine	equant-prismatic	100
clinopyroxene	subhedral	

Groundmass Intergranular groundmass composed of olivine, clinopyroxene, and plagioclase.

Vesicles Actinolite possibly found as vesicle fillings (could also be albite). Vesicles are mostly round and 1-3 mm in diameter. Vesicles occur in upper half of fragment.

Color purple-grey

Structure clast

Alteration highly (40-80%)

Vein/fracture Fractures are filled with whitish- green mineral.

Unit Summary

Fine-grained, amygdaloidal, highly olivine-clinopyroxene phyric basaltic clasts.

Core Photo

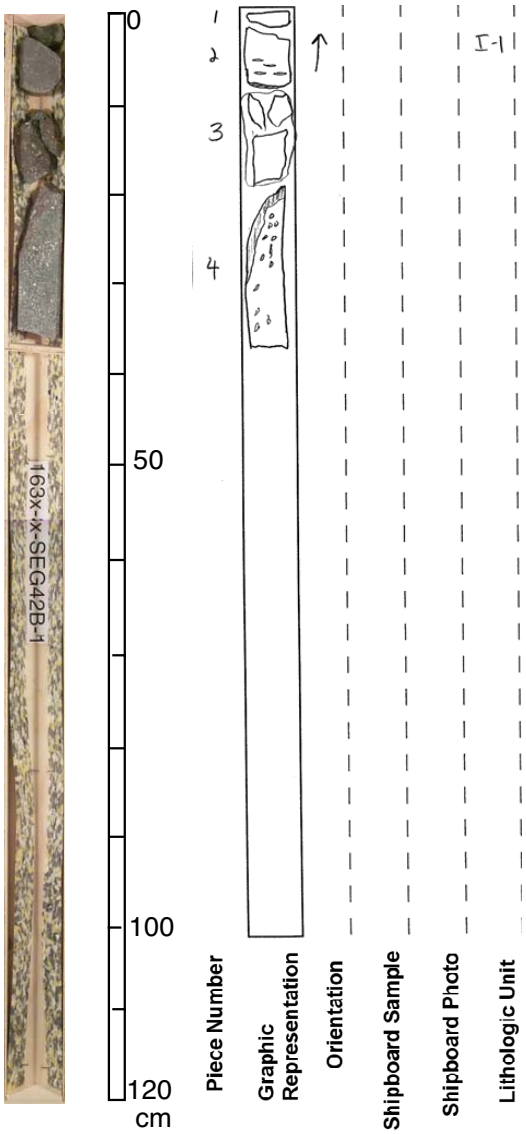
ODP LEG 163X UNIT SUMMARIES **163X-SEG42B-1-1, 0-40**

Transect EG65

Interval 0 - 40 cm **Depth Interval** 0-.4 mbsf

Unit I-1

Rock highly olivine-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	15	1-5
plagioclase	8	1

Phenocrysts	Shape	Alteration %
olivine	prismatic to equant	90
plagioclase	tabular	50

Groundmass Seriate groundmass with olivine, plagioclase, and clinopyroxene.

Vesicles Vesicles irregularly shaped, most abundant top of Piece 4. Vesicles lined with chlorite followed by quartz and then calcite. No open spaces remaining. Vesicles in Piece 2 are flatten normal to core axis.

Color purple

Structure massive

Alteration highly (40-80%)

Vein/fracture Top of Piece 4, steep fracture (30 degrees to core axis) with golden luster sulfide mineralization.

Unit Summary

Fine-grained, seriate and amygdaloidal, highly olivine-plagioclase phyric basalt. Vesicles are irregularly shaped and most abundant in the top portion of Piece 4. Vesicles are lined with chlorite followed by quartz and calcite. The groundmass is highly silicified and olivine phenocrysts are at least 90 % altered to iddingsite.

Core Photo

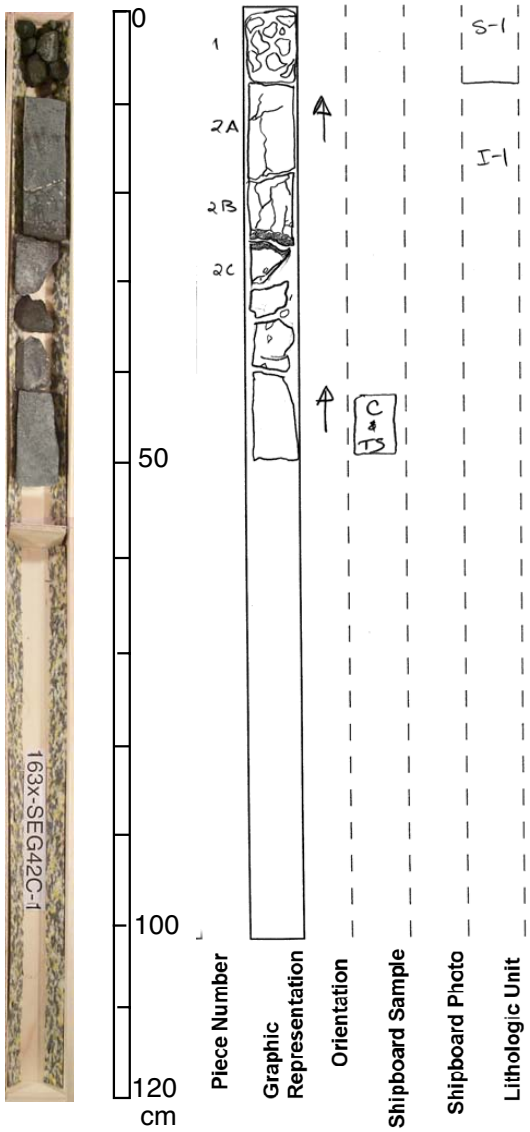
ODP LEG 163X UNIT SUMMARIES **163X-SEG42C-1-1, 0-8**

Transect EG65

Interval 0 - 8 cm **Depth Interval** 0-.08 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Well-rounded felsic gneiss and basalt clasts.

Core Photo

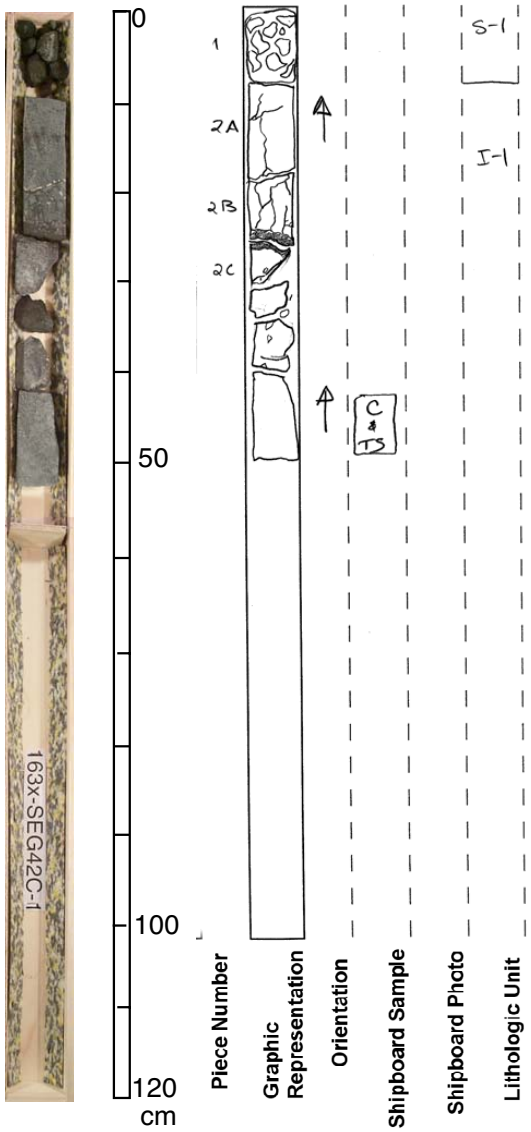
ODP LEG 163X UNIT SUMMARIES **163X-SEG42C-1-1, 8-48**

Transect EG65

Interval 8 - 48 cm **Depth Interval** .08-.48 mbsf

Unit I-1

Rock highly olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	15	1-4

Phenocrysts	Shape	Alteration %
olivine	prismatic-equant	100

Groundmass

Vesicles Numerous irregularly shaped vesicles, 1-3 mm, lined with chlorite, followed by quartz and calcite.

Color purple-green

Structure massive

Alteration highly (40-80%)

Vein/fracture

Unit Summary

Fine-grained, highly vesicular and amygdaloidal, highly olivine phyric basalt. Vesicles often only partially filled are lined with chlorite, followed by quartz, and then calcite. The groundmass is highly silicified and olivine is completely altered to iddingsite.

Core Photo

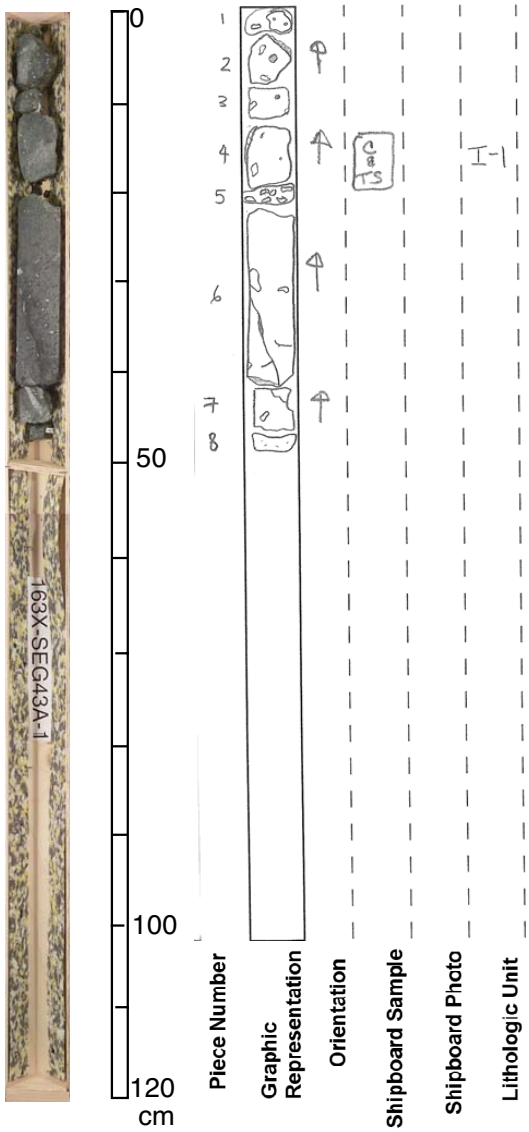
ODP LEG 163X UNIT SUMMARIES **163X-SEG43A-1-1, 0-47**

Transect EG65

Interval 0 - 47 cm **Depth Interval** 0-.47 mbsf

Unit I-1

Rock highly olivine-plagioclase-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	12	1-2
plagioclase	8	1
clinopyroxene	3	1

Phenocrysts	Shape	Alteration %
olivine	equant-prismatic	100
plagioclase	euhedral	50
clinopyroxene	subhedral	50

Groundmass Intergranular groundmass with clinopyroxene, olivine, and plagioclase.

Vesicles Vesicles, 2-5 mm in diameter, are filled with white material, calcite, and rimmed with a green mineral. They vary in shape from circular to elongate. Some smaller, about 1 mm, vesicles are filled only with a green mineral.

Color grey green

Structure massive

Alteration highly (40-80%)

Vein/fracture Irregular fractures are filled with white mineral.

Unit Summary

Fine-grained, highly vesicular and amygdaloidal, highly olivine-pyroxene phyric basalt. Vesicles are filled with white material, calcite and rimmed with a green mineral. They vary in shape from circular to elongate.

Core Photo

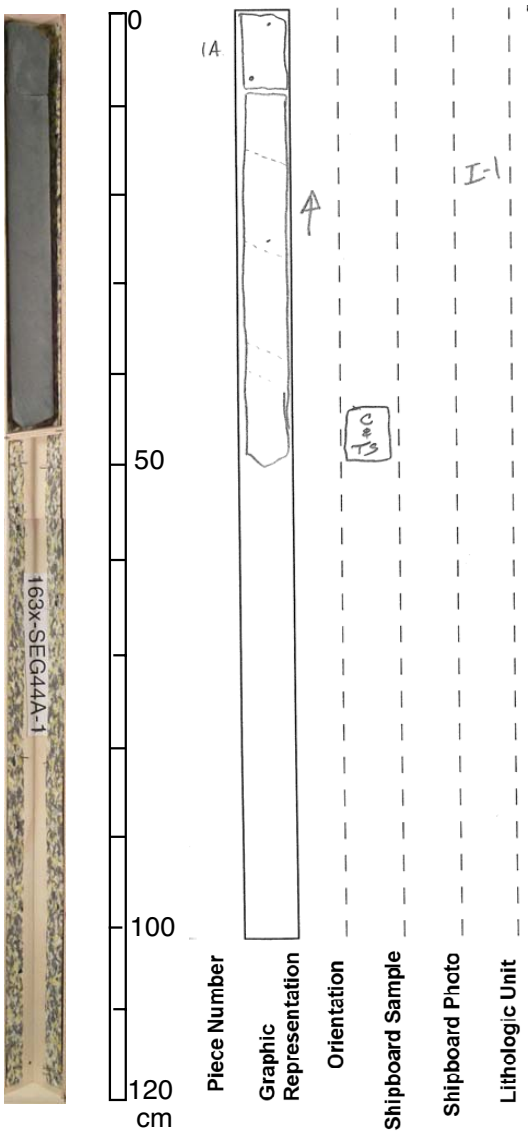
ODP LEG 163X UNIT SUMMARIES **163X-SEG44A-1-1, 0-46**

Transect EG65

Interval 0 - 46 cm **Depth Interval** 0-.46 mbsf

Unit I-1

Rock aphyric olivine-basalt



Phenocrysts	Modal %	Size mm
olivine	<1	<1

Phenocrysts	Shape	Alteration %
olivine	equant	0

Groundmass Intergranular groundmass composed of olivine, clinopyroxene, and plagioclase.

Vesicles vesicles filled with dark clay mineral

Color dark grey

Structure massive with weak planar banding defined by small vesicles

Alteration fresh (<2%)

Vein/fracture

Unit Summary

Fine-grained aphyric olivine-basalt with planar banding defined by vesicle concentrations. Top of core has red oxidized, weathered surface.

Core Photo

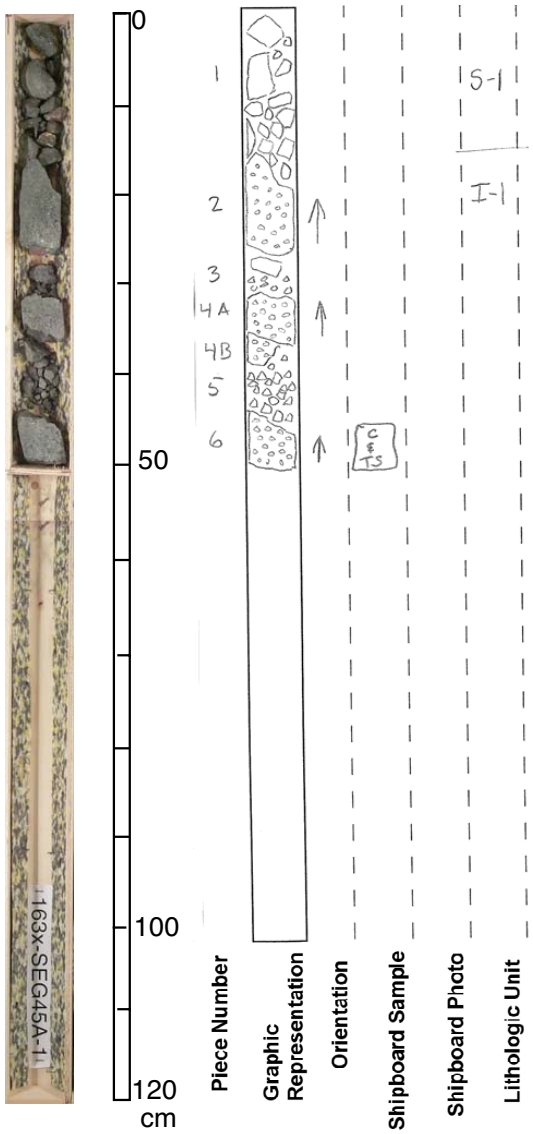
ODP LEG 163X UNIT SUMMARIES **163X-SEG45A-1-1, 0-16**

Transect EG65

Interval 0 - 16 cm **Depth Interval** 0-.16 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular to rounded fragments of basalt (most abundant), gneiss and granite. Sizes range from approximately 0.5 to 4 cm.

Core Photo

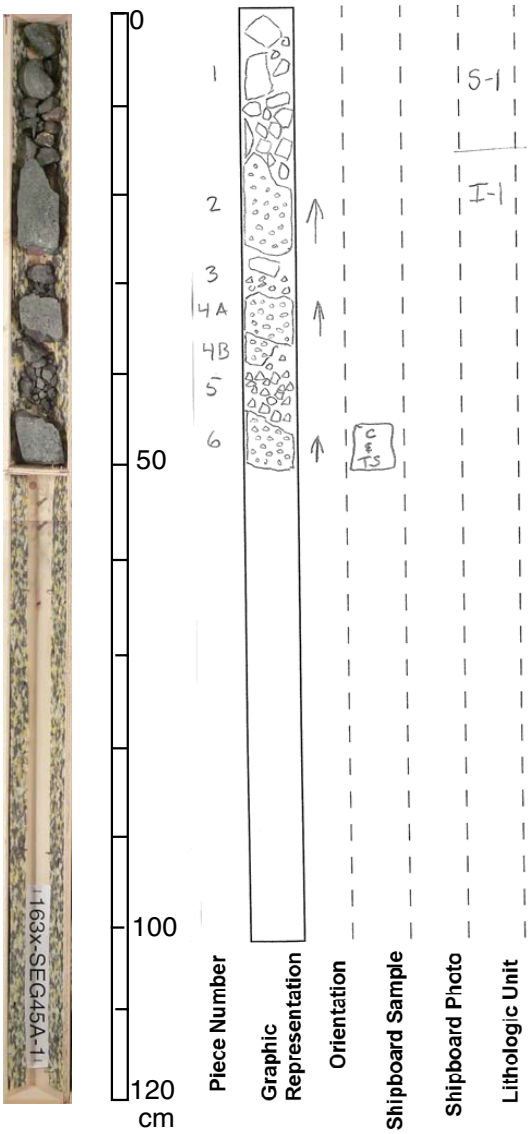
ODP LEG 163X UNIT SUMMARIES **163X-SEG45A-1-1, 16-49**

Transect EG65

Interval 16 - 49 cm **Depth Interval** .16-.49 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	5	<1
clinopyroxene	3	<1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
clinopyroxene	sub- to euhedral	70

Groundmass Composed mainly of plagioclase and clinopyroxene in an intergranular texture.

Vesicles Highly vesicular vesicles are filled with grey to green clays and minor calcite. Shapes are irregular, but rounded and sizes range from 0.5 to 5 mm.

Color grey green

Structure flow

Alteration very highly (80-95%)

Vein/fracture highly fractured, almost crumbly

Unit Summary

Moderately olivine-clinopyroxene phyric and amygdaloidal basalt, very highly altered with crumbling appearance. Olivine and clinopyroxene phenocrysts have been completely or partially altered to green clays. The amount of amygdules is very high, the infilling material is mainly green clays with minor amounts of calcite. Amygdule sizes vary between 0.5 and 5 mm and have rounded shapes.

Core Photo

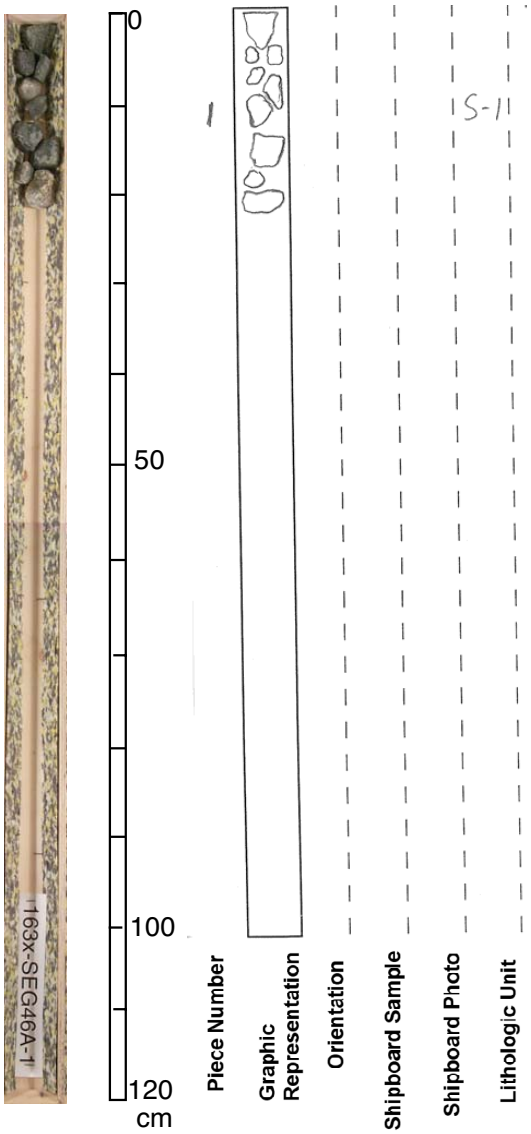
ODP LEG 163X UNIT SUMMARIES **163X-SEG46A-1-1, 0-22**

Transect EG65

Interval 0 - 22 cm **Depth Interval** 0-.22 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Clasts of basalt, gneiss, and quartz with no preserved matrix sediment. Clast shapes are angular to rounded, sizes range from 1.5 to 4 cm.

Core Photo

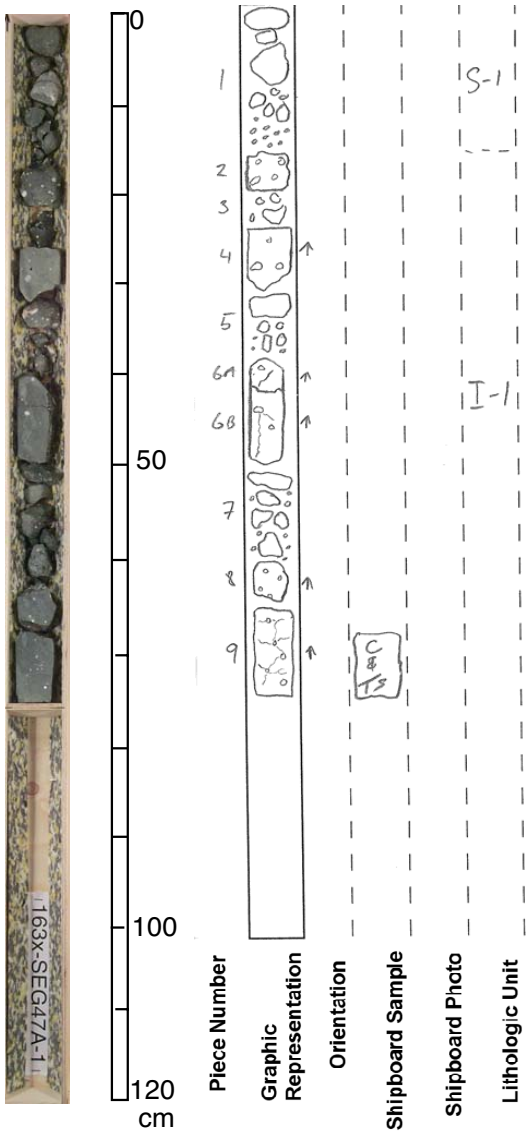
ODP LEG 163X UNIT SUMMARIES **163X-SEG47A-1-1, 0-16**

Transect EG65

Interval 0 - 16 cm **Depth Interval** 0-.16 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Angular to subrounded basaltic and gneissic clasts ranging from about 1.5 mm to 4 cm.

Core Photo

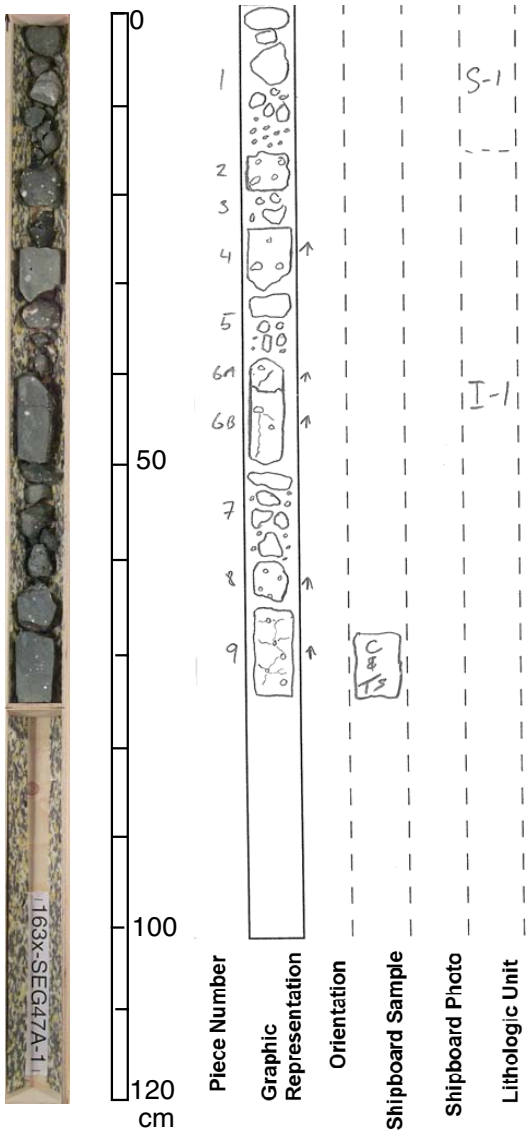
ODP LEG 163X UNIT SUMMARIES **163X-SEG47A-1-1, 16-74**

Transect EG65

Interval 16 - 74 cm **Depth Interval** .16-.74 mbsf

Unit I-1

Rock sparsely olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	2	1
olivine	2	1

Phenocrysts	Shape	Alteration %
clinopyroxene	subhedral	
olivine	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular texture.

Vesicles Amygdules are spherical to ellipsoid, approximately 0.5 to 6 mm in diameter, and filled, some only partially, with zeolites and pale green to white clays.

Color light grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Thin (<0.5 mm wide), irregular veins are filled with zeolite (?), and tend to interconnect vesicles.

Unit Summary

Light gray, sparsely clinopyroxene phyric basalt with 0.5 to 6 mm large amygdules filled with zeolites or very pale green clays. The basalt is moderately altered, the degree of alteration is highest close to vesicles. Thin (< 0.5 mm wide) zeolite-mineralized veins interconnect amygdules.

Core Photo

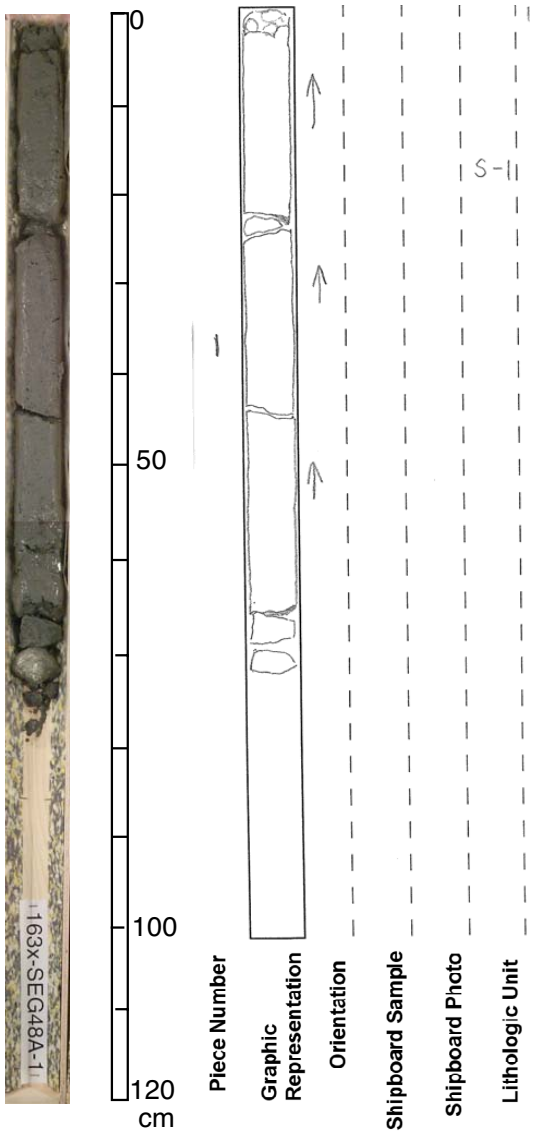
ODP LEG 163X UNIT SUMMARIES **163X-SEG48A-1-1, 0-71**

Transect EG65

Interval 0 - 71 cm **Depth Interval** 0-.71 mbsf

Unit S-1

Rock diamicton



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color grey

Structure

Alteration

Vein/fracture

Unit Summary

Massive glaciomarine muddy sandstone with foraminifera; the grain size distribution is polymodal from clay to granule and modus in the fine-grained silt fraction, with a few pebble-sized clasts at the top and the bottom of the unit. It is matrix-supported and poorly sorted with rounded clasts and a diverse material-composition. Mineral composition: 65 % quartz, 7 % clay minerals, 4 % pyroxene, 3 % potassic feldspar, 3 % other feldspars, 3 % mica (muscovite). The biogene material constitutes approximately 5 %, the main part of this is foraminifera. The sediment also contains about 5 % basaltic rock fragments and 3% rock fracments from unspecified rocks.

Core Photo

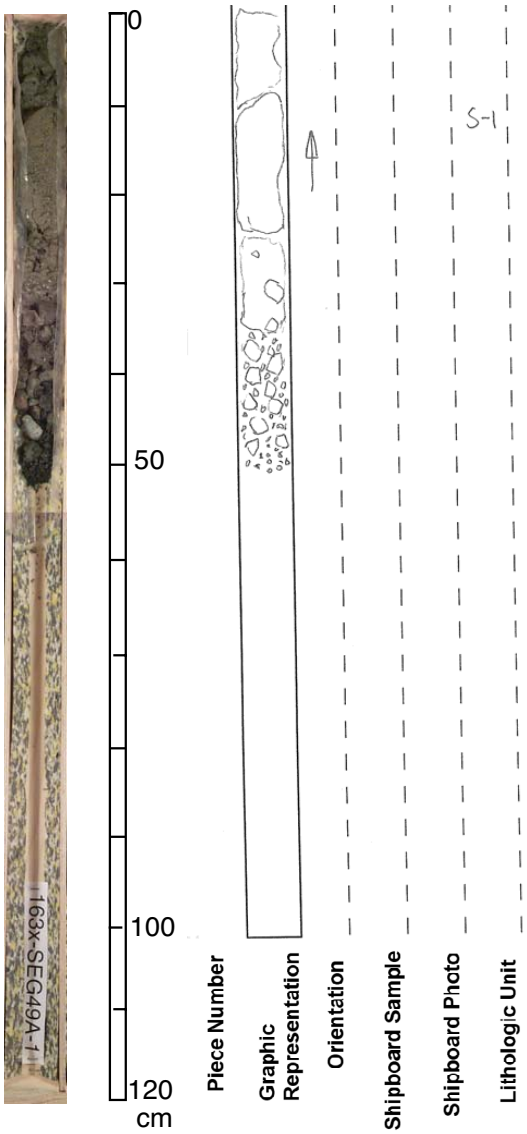
ODP LEG 163X UNIT SUMMARIES **163X-SEG49A-1-1, 0-50**

Transect EG65

Interval 0 - 50 cm **Depth Interval** 0-.5 mbsf

Unit S-1

Rock diamicton



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color grey

Structure

Alteration

Vein/fracture

Unit Summary

Matrix-supported, poorly sorted muddy sandstone with foraminiferas in the upper 25cm of the unit (see description for 163X-SEG48A-1-1). The lower part of the unit is a gravel layer composed of pebble-sized, sub-rounded basaltic and gneissic clasts with gravel in the matrix.

Core Photo

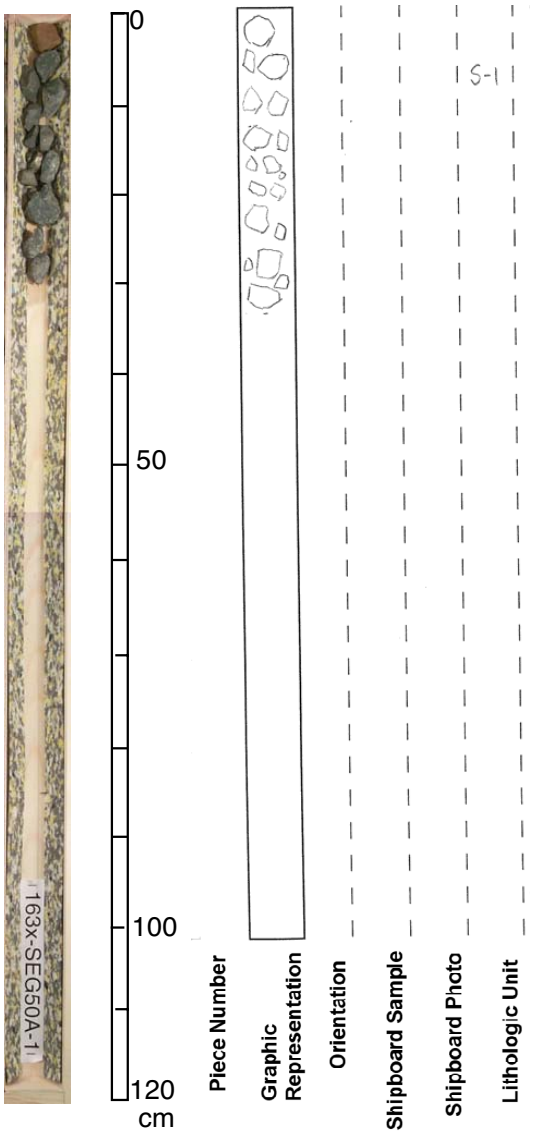
ODP LEG 163X UNIT SUMMARIES **163X-SEG50A-1-1, 0-33**

Transect EG65

Interval 0 - 33 cm **Depth Interval** 0-.33 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Pebble-sized clasts (1-4 cm) of basalt and gneiss with angular to sub-rounded shapes. No matrix preserved; may have been washed out during drilling.

Core Photo

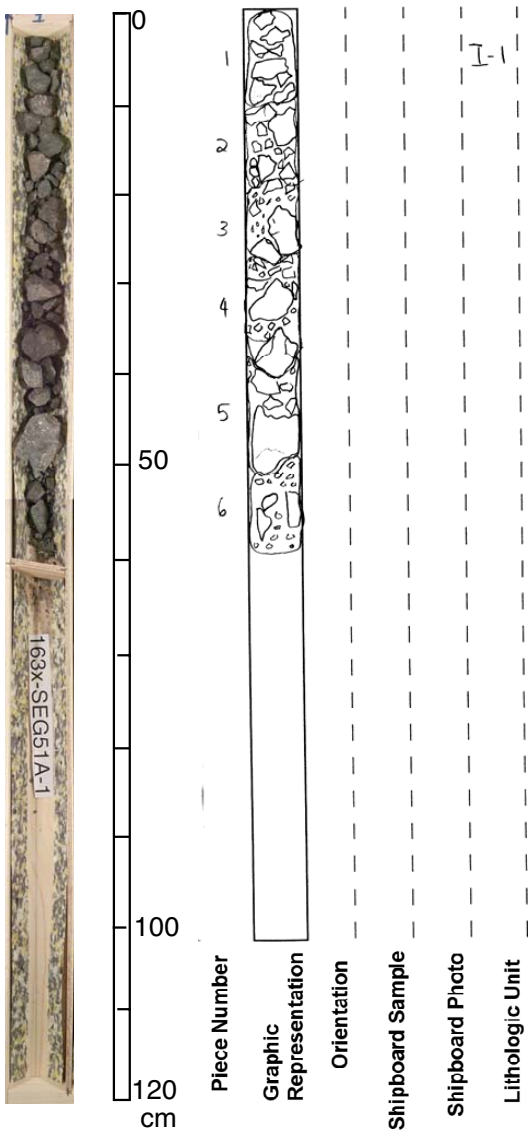
ODP LEG 163X UNIT SUMMARIES **163X-SEG51A-1-1, 0-52**

Transect EG65

Interval 0 - 52 cm **Depth Interval** 0-.52 mbsf

Unit I-1

Rock moderately plagioclase-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	3	1-4
clinopyroxene	2	2-3

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass very fine grained

Vesicles Vesicles are irregularly shaped, about 1 mm in size, filled with a white, non-calcite, mineral

Color dark grey

Structure massive

Alteration highly (40-80%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, moderately plagioclase-clinopyroxene phyric basalt. The unit is highly fractured and may represent flow top rubble.

Core Photo

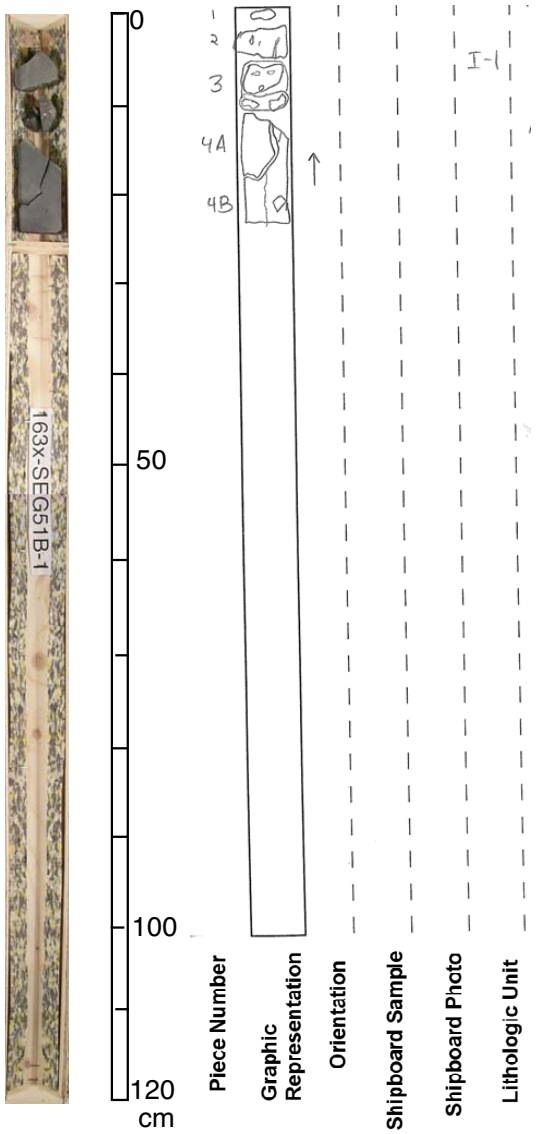
ODP LEG 163X UNIT SUMMARIES **163X-SEG51B-1-1, 0-23**

Transect EG65

Interval 0 - 23 cm **Depth Interval** 0-.23 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene phyric olivine-basalt



Phenocrysts	Modal %	Size mm
olivine	3	0.5-1
clinopyroxene	2	0.5

Phenocrysts	Shape	Alteration %
olivine	equant- prismatic	10
clinopyroxene	subhedral	0

Groundmass Composed of olivine, clinopyroxene, and plagioclase in a granular texture.

Vesicles non-vesicluar

Color black

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, moderately olivine-clinopyroxenephyric olivine-basalt. Contains what appears to be a cm-sized xenolith of olivine and pyroxene.

Core Photo

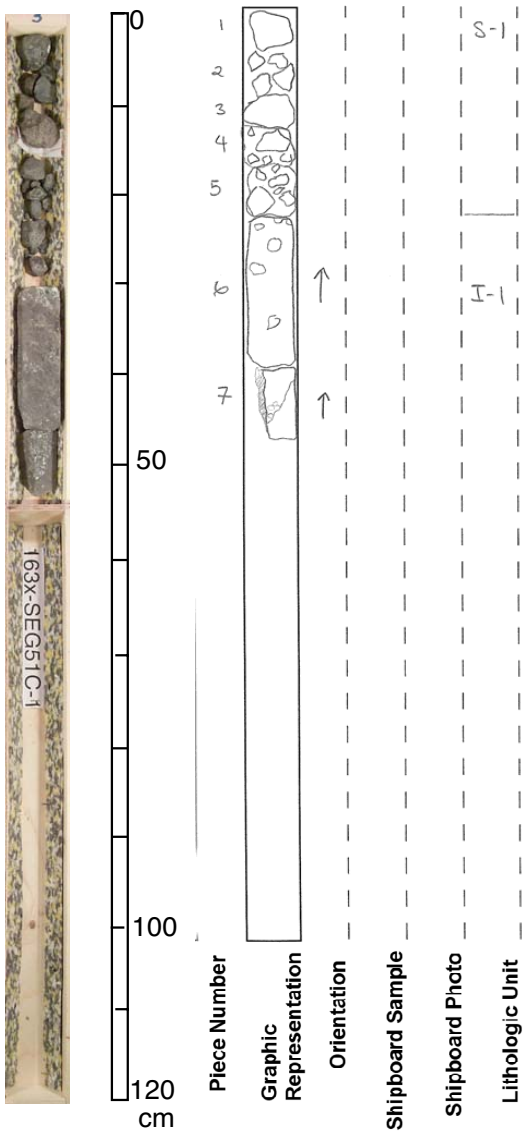
ODP LEG 163X UNIT SUMMARIES **163X-SEG51C-1-1, 0-22**

Transect EG65

Interval 0 - 22 cm **Depth Interval** 0-.22 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Basalt and gneiss clasts, varying in size from 0.3-6 cm.

Core Photo

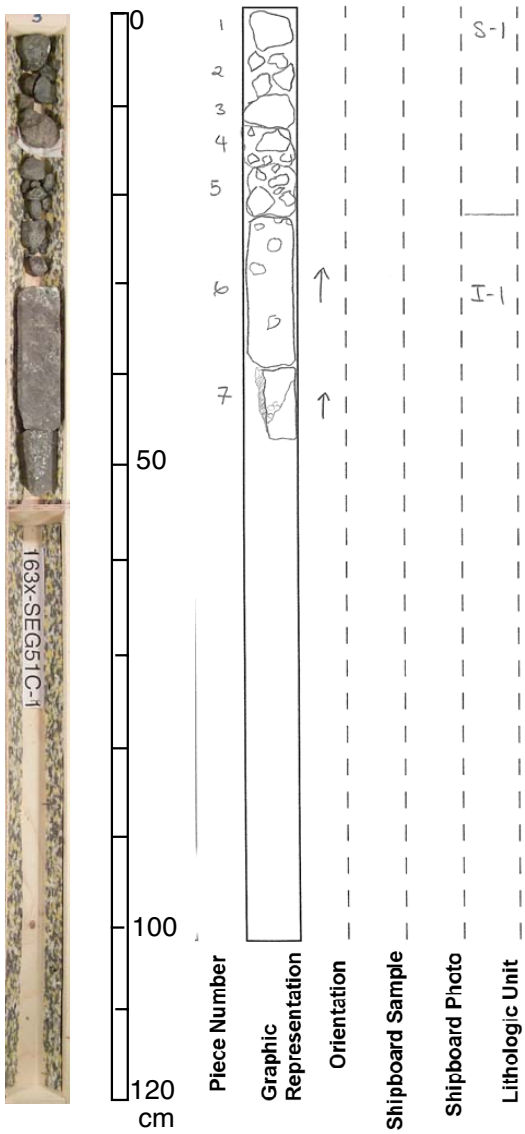
ODP LEG 163X UNIT SUMMARIES **163X-SEG51C-1-1, 22-45**

Transect EG65

Interval 22 - 45 cm **Depth Interval** .22-.45 mbsf

Unit I-1

Rock moderately clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	3	1

Phenocrysts	Shape	Alteration %
clinopyroxene	subhedral	

Groundmass Composed of plagioclase, clinopyroxene, and olivine in a very fine-grained, granular tintergrowth.

Vesicles Open vesicles are 0.5-2 mm in size. Amygduals are filled with calcite and quartz and lined with red clay.

Color light purple grey

Structure

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, vesicular, moderately clinopyroxene phyric basalt.

Core Photo

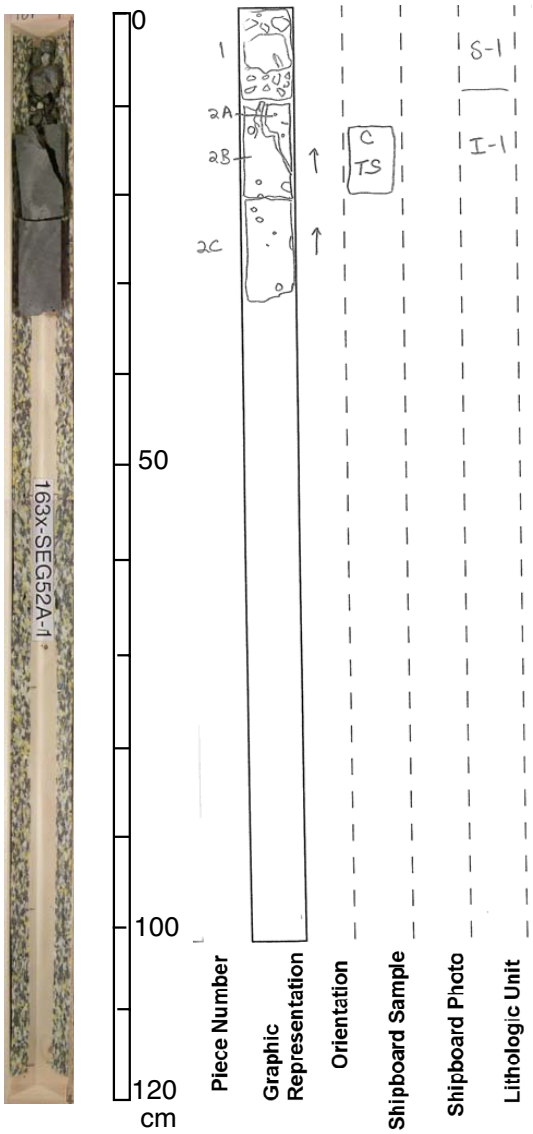
ODP LEG 163X UNIT SUMMARIES **163X-SEG52A-1-1, 0-10**

Transect EG65

Interval 0 - 10 cm **Depth Interval** 0-.1 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Pebble-size rock fragments including basaltic and gneissic varities.

Core Photo

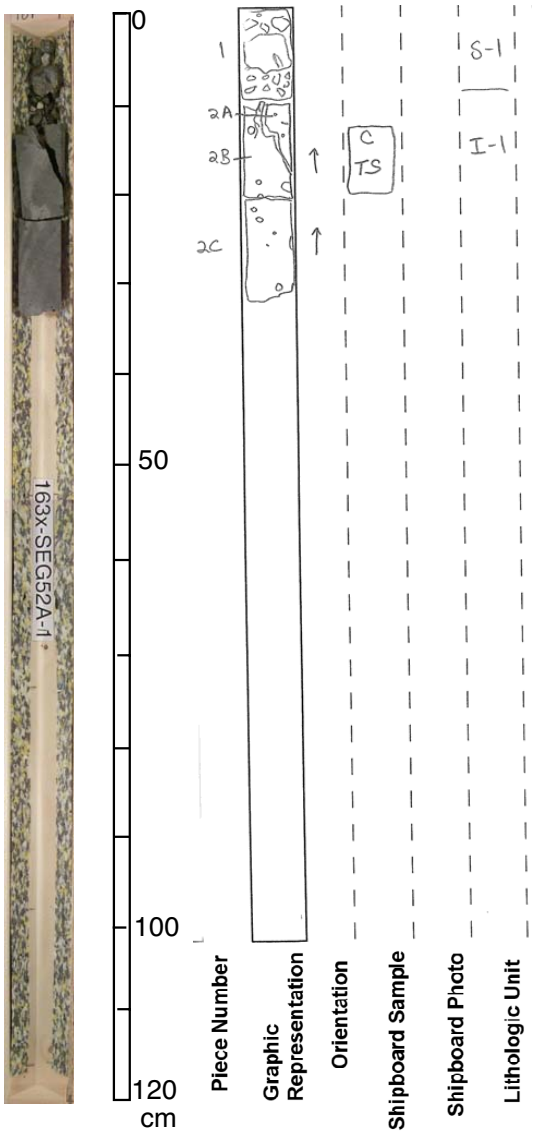
ODP LEG 163X UNIT SUMMARIES **163X-SEG52A-1-1, 10-31**

Transect EG65

Interval 10 - 31 cm **Depth Interval** .1-.31 mbsf

Unit I-1

Rock aphyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	<1	0.5

Phenocrysts	Shape	Alteration %
clinopyroxene	subhedral	

Groundmass Composed of clinopyroxene and plagioclase in a seriate texture.

Vesicles small (1-2 mm) spherical vesicles filled with grey clay

Color dark grey

Structure massive

Alteration fresh (<2%)

Vein/fracture

Unit Summary

Fine-grained, aphyric basalt with oxidized fractures.

Core Photo

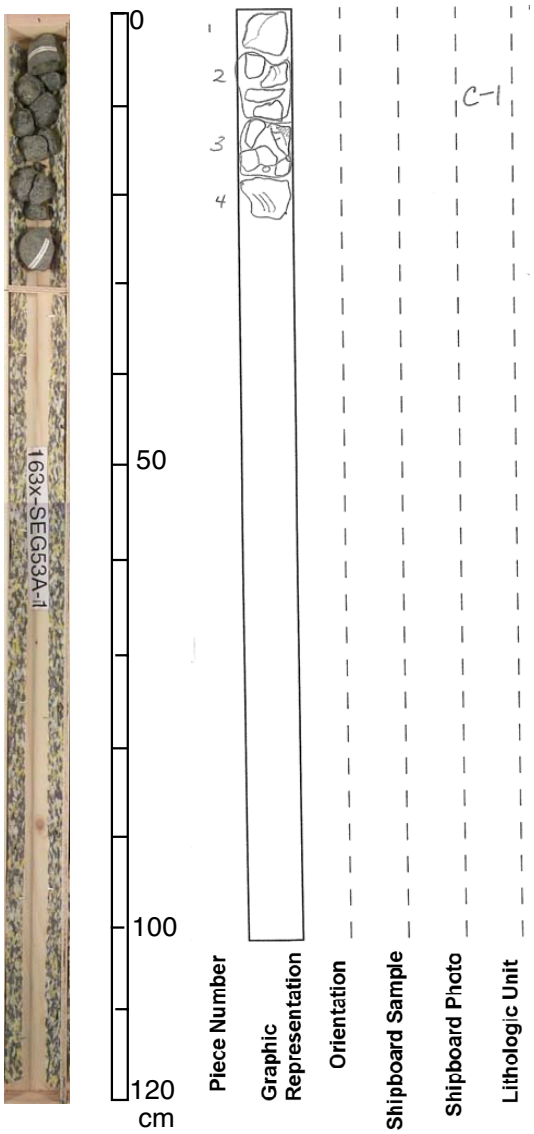
ODP LEG 163X UNIT SUMMARIES **163X-SEG53A-1-1, 0-22**

Transect EG65

Interval 0 - 22 cm **Depth Interval** 0-.22 mbsf

Unit C-1

Rock aphyric basalt



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass Clinopyroxene and plagiolcase in groundmass. with abundant mesostasis altered to grey clay.

Vesicles spherical vesicles filled with quartz

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, aphyric basalt clasts. Very similar petrographically to Unit I-1 of Hole SEG52B.

Core Photo

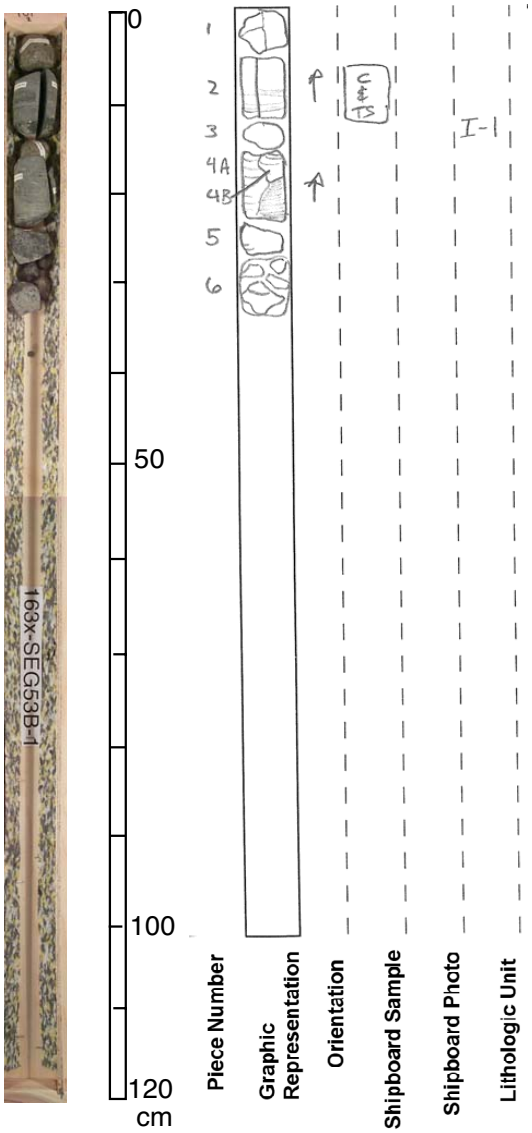
ODP LEG 163X UNIT SUMMARIES **163X-SEG53B-1-1, 0-31**

Transect EG65

Interval 0 - 31 cm **Depth Interval** 0-.31 mbsf

Unit I-1

Rock aphyric basalt



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass Clinopyroxene and plagiolcase in groundmass with abundant mesostasis altered to grey clay.

Vesicles spherical vesicles filled with quartz

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, aphyric basalt.

Core Photo

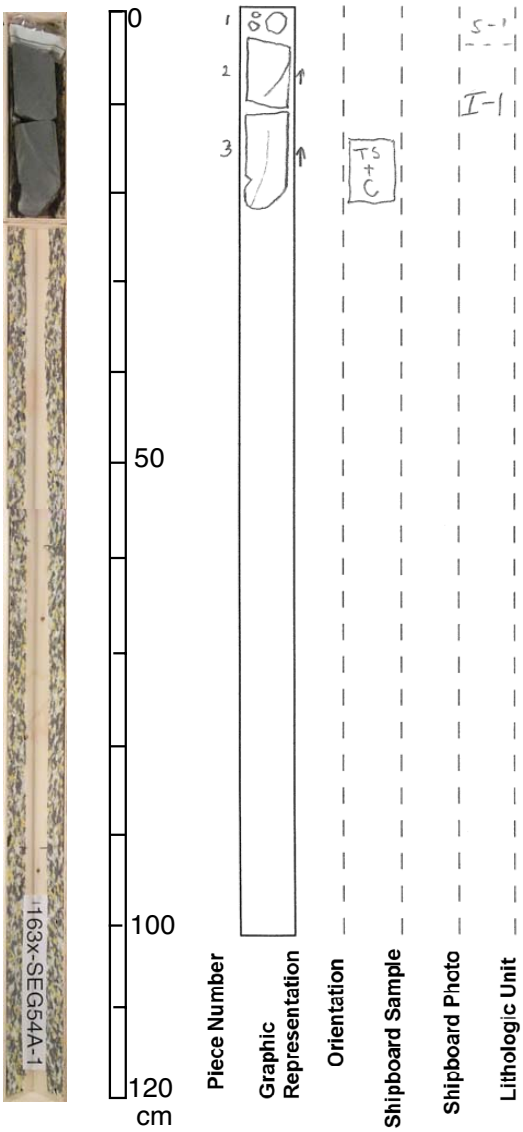
ODP LEG 163X UNIT SUMMARIES **163X-SEG54A-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit S-1

Rock sparsely clinopyroxene-olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	<1	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
clinopyroxene	subhedral	

Groundmass Composed of plagiopclase and clinopyroxene in an intergranular texture.

Vesicles Small vesicles, less than or equal to 1 mm, are filled with grey clays.

Color grey

Structure clast

Alteration slightly (2-10%)

Vein/fracture Veins are thinner than 1 mm and filled with a white mineral, not carbonate. Alteration rims around veins results in a distinctly darker color to the basalt.

Unit Summary

Small subangular basaltic pebbles.

Core Photo

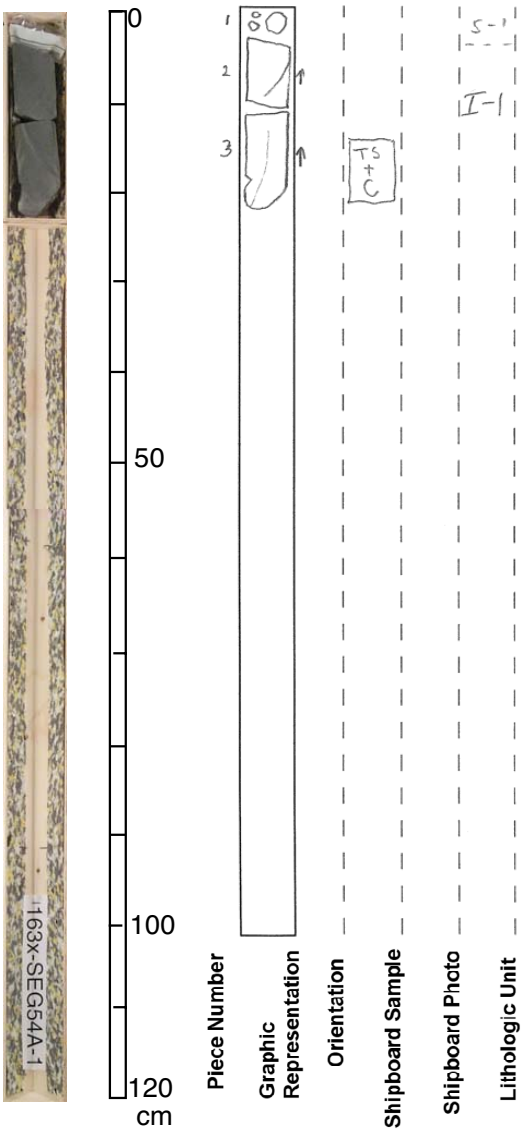
ODP LEG 163X UNIT SUMMARIES **163X-SEG54A-1-1, 3-22**

Transect EG65

Interval 3 - 22 cm **Depth Interval** .03-.22 mbsf

Unit I-1

Rock sparsely clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	<1	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
clinopyroxene	subhedral	

Groundmass Composed of lagioclase and clinopyroxene in an intergranular texture.

Vesicles Small irregular to spherical vesicles, most less than 1 mm, are filled withe grey clay minerals

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Veins are thinner than about 1 mm and are filled with a white mineral (not carbonate). Alteration rims next to veins causes a darker colour of the basalt.

Unit Summary

Sparsely clinopyroxene phyric basalt clasts with minor amounts (< 1 vol %) of olivine phenocrysts. The basalt is slightly altered. Vesicles are mostly less than 1mm in diameter and are filled with grey clay minerals. Thin veins are filled with a translucent mineral (not carbonate). Thin dark alteration rims occur in the basalt around veins.

SEG55A-1 No recovery

Core Photo

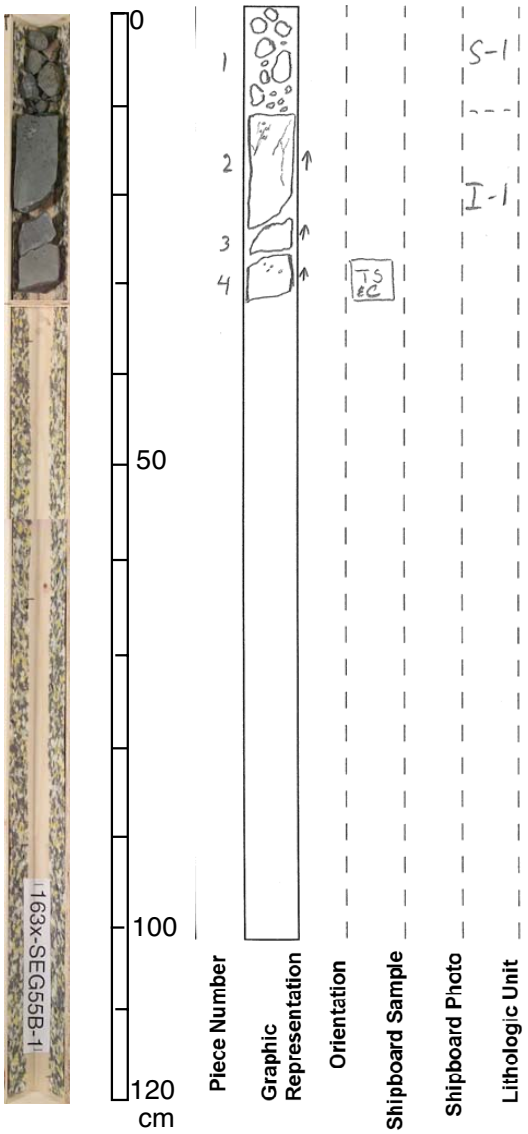
ODP LEG 163X UNIT SUMMARIES **163X-SEG55B-1-1, 0-12**

Transect EG65

Interval 0 - 12 cm **Depth Interval** 0-.12 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular to subrounded pebbles of basalt and granite varying in size from 5 mm to 3 cm. Some clasts have adhering mud, presumably remains of an original matrix mud.

Core Photo

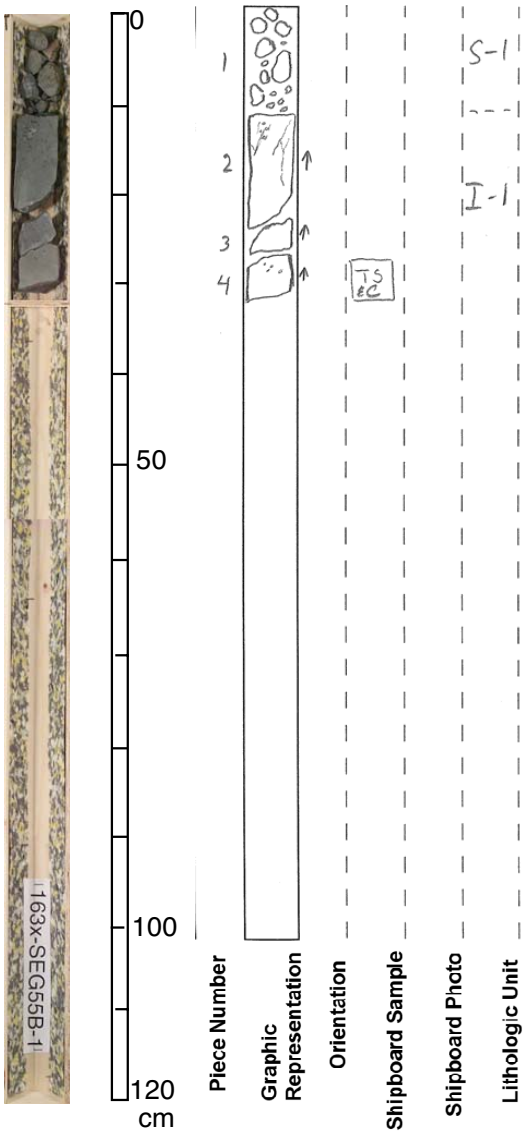
ODP LEG 163X UNIT SUMMARIES **163X-SEG55B-1-1, 12-32**

Transect EG65

Interval 12 - 32 cm **Depth Interval** .12-.32 mbsf

Unit I-1

Rock sparsely olivine-clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2/1	1
clinopyroxene	2	1
plagioclase	1	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100/0
clinopyroxene	subhedral	
plagioclase	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular texture.

Vesicles Almost all vesicles are lined with minerals having botryoidal crystal habits, some of these are carbonate, but there are at least two different infilling minerals (grey and white). There are altered glass linings the vesicles.

Color light grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Veins are filled with white minerals (quartz?), and are associated with vesicles. Usually they are less than 2 mm wide.

Unit Summary

Fine-grained, vesicular, sparsely olivine-clinopyroxene-plagioclase phyric to glomerophyric basalt. The basalt contains mm-sized inclusions of olivine and pyroxenes. This unit is very similar to Unit I-1 of Hole SEG55C.

Core Photo

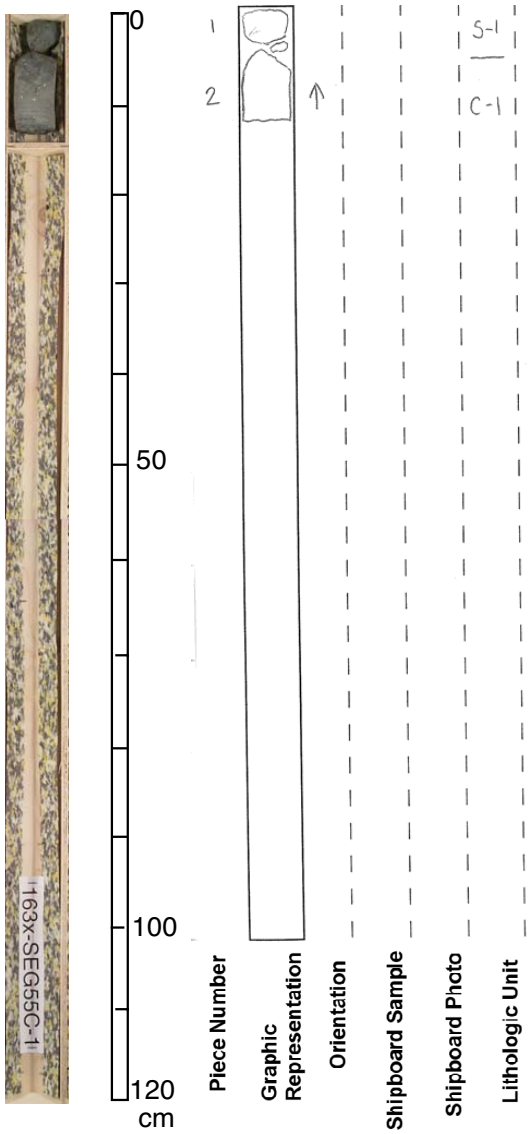
ODP LEG 163X UNIT SUMMARIES **163X-SEG55C-1-1, 0-4**

Transect EG65

Interval 0 - 4 cm **Depth Interval** 0-.04 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular pieces of basalt and diorite, 1 to 4 cm long,.

Core Photo

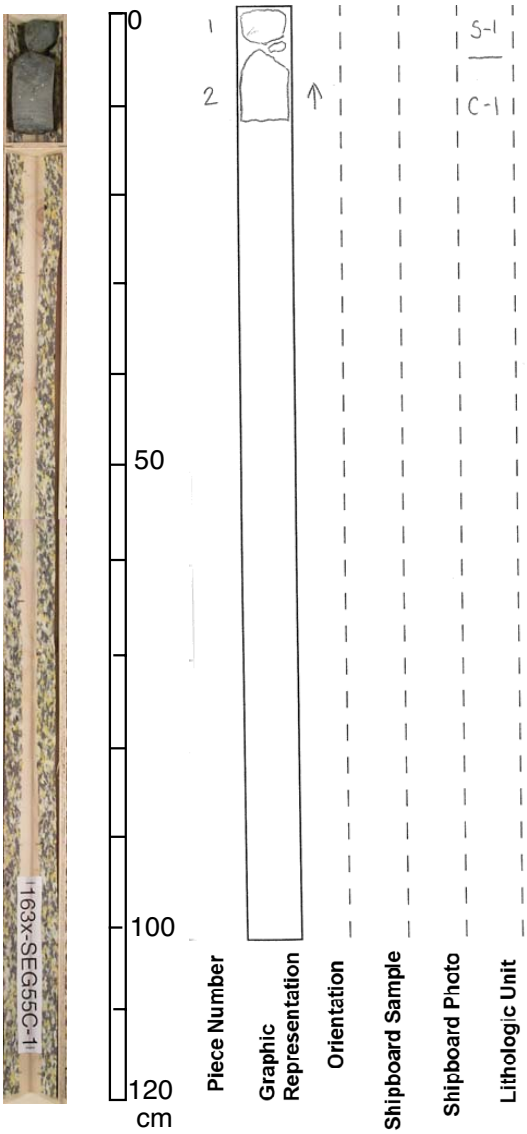
ODP LEG 163X UNIT SUMMARIES **163X-SEG55C-1-1, 4-13**

Transect EG65

Interval 4 - 13 cm **Depth Interval** .04-.13 mbsf

Unit C-1

Rock moderately plagioclase-clinopyroxene-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2	1
plagioclase	5	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100/0
plagioclase	subhedral, laths	100
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Irregular to spherical vesicles, 0.5-3 mm in diameter, lined with green minerals and inner filling of white/translucent minerals, some with botryoidal habits (some of these are carbonates).

Color grey

Structure clast

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, moderately plagioclase-clinopyroxene-olivine phyric to glomerophyric basalt clast. Small inclusions are mm-sized and fresh and contain olivine and pyroxenes. This unit are very similar to Unit I-1 of Hole SEG55C.

Core Photo

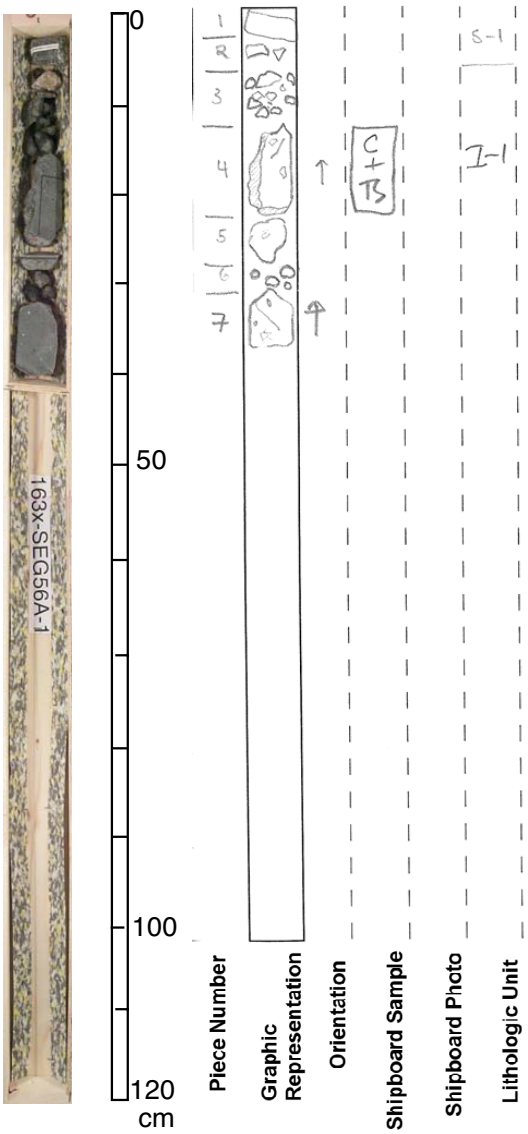
ODP LEG 163X UNIT SUMMARIES **163X-SEG56A-1-1, 0-7**

Transect EG65

Interval 0 - 7 cm **Depth Interval** 0-.07 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular pebbles of biotite gneiss and quartzite.

Core Photo

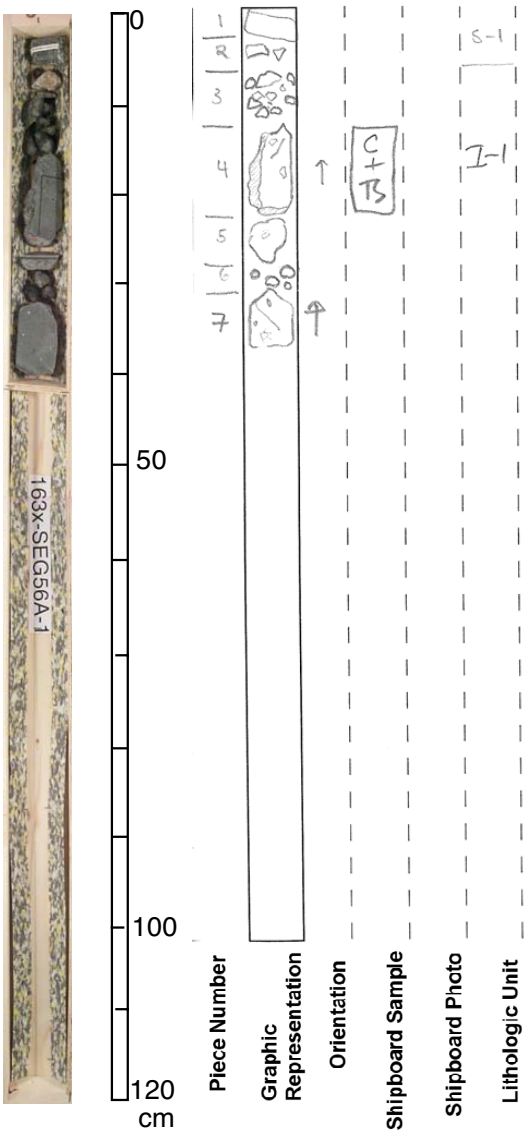
ODP LEG 163X UNIT SUMMARIES **163X-SEG56A-1-1, 7-35**

Transect EG65

Interval 7 - 35 cm **Depth Interval** .07-.35 mbsf

Unit I-1

Rock moderately plagioclase-clinopyroxene-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	1	0.5
plagioclase	4	0.5-1
clinopyroxene	2	0.5

Phenocrysts	Shape	Alteration %
olivine	subhedral	high
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass

Vesicles Round vesicles, about 1 mm in size in Piece 7. Also present are amygduals, 1-2 mm in size, filled with a white mineral.

Color grey

Structure massive

Alteration

Vein/fracture Irregular fractures in the clasts are filled with white mineral, calcite.

Unit Summary

Fine-grained, amygdaloidal, moderately plagioclase-clinopyroxene-olivine phyric to glomerophyric basalt.

Core Photo

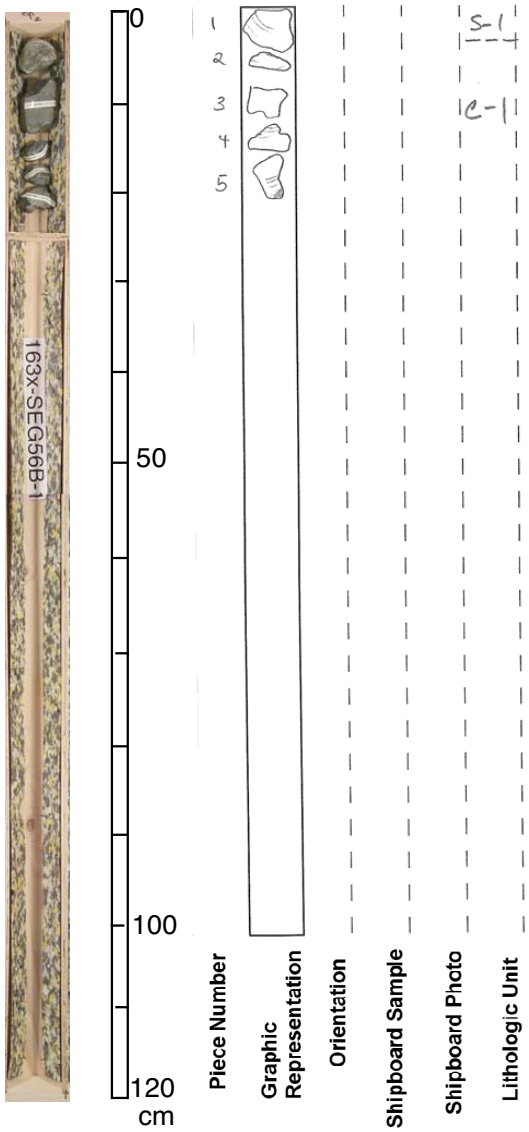
ODP LEG 163X UNIT SUMMARIES **163X-SEG56B-1-1, 0-5**

Transect EG65

Interval 0 - 5 cm **Depth Interval** 0-.05 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Single subangular clast of felsic biotite-bearing gneiss.

Core Photo

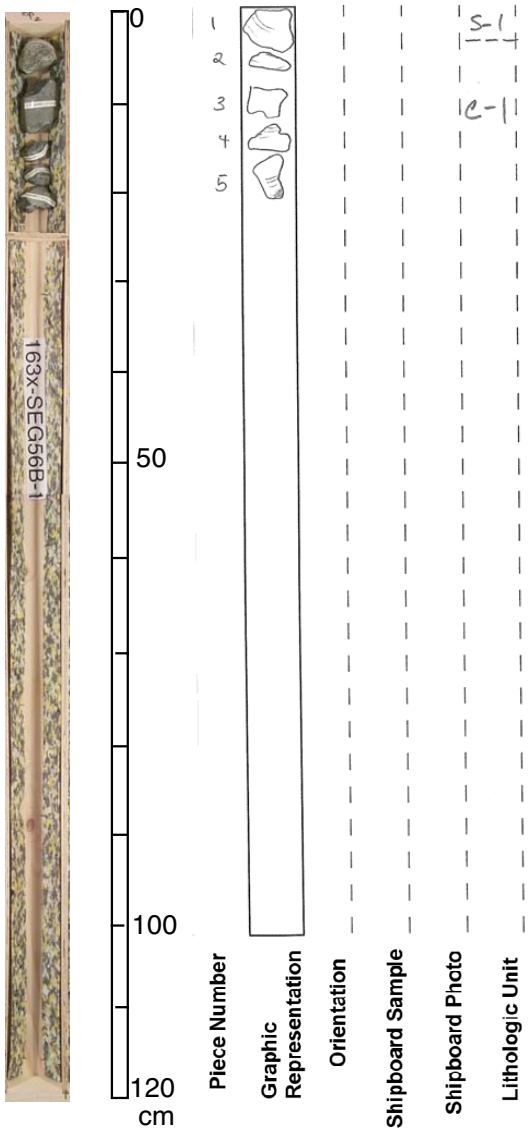
ODP LEG 163X UNIT SUMMARIES **163X-SEG56B-1-1, 5-19**

Transect EG65

Interval 5 - 19 cm **Depth Interval** .05-.19 mbsf

Unit C-1

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	3	0.5
plagioclase	3	0.5
clinopyroxene	1	0.5

Phenocrysts	Shape	Alteration %
olivine	euhedral	10
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass

Vesicles Occassional sub-rounded vesicles, 3-5 mm, infilled with white translucent mineral, not calcite.

Color grey

Structure clast

Alteration fresh (<2%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, plagioclase-olivine-clinopyroxene phyric basalt clasts.

Core Photo

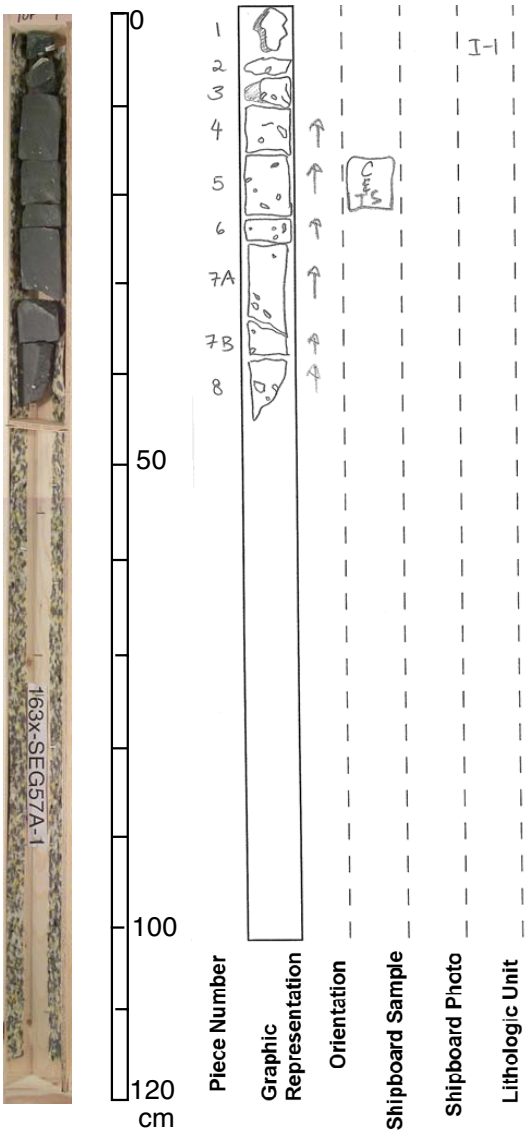
ODP LEG 163X UNIT SUMMARIES **163X-SEG57A-1-1, 0-45**

Transect EG65

Interval 0 - 45 cm **Depth Interval** 0-.45 mbsf

Unit I-1

Rock sparsely clinopyroxene-plagioclase-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	<1	1
plagioclase	<1	1
clinopyroxene	<1	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of clinopyroxene, plagioclase, and olivine in a granular fabric.

Vesicles Vesicles are filled with white mineral, not calcite. These amygduals are 1-3 mm in size and are generally elongate in a similar direction.

Color dark grey

Structure massive

Alteration fresh (<2%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, sparsely clinopyroxene-plagioclase-olivine phyric basalt.

Core Photo

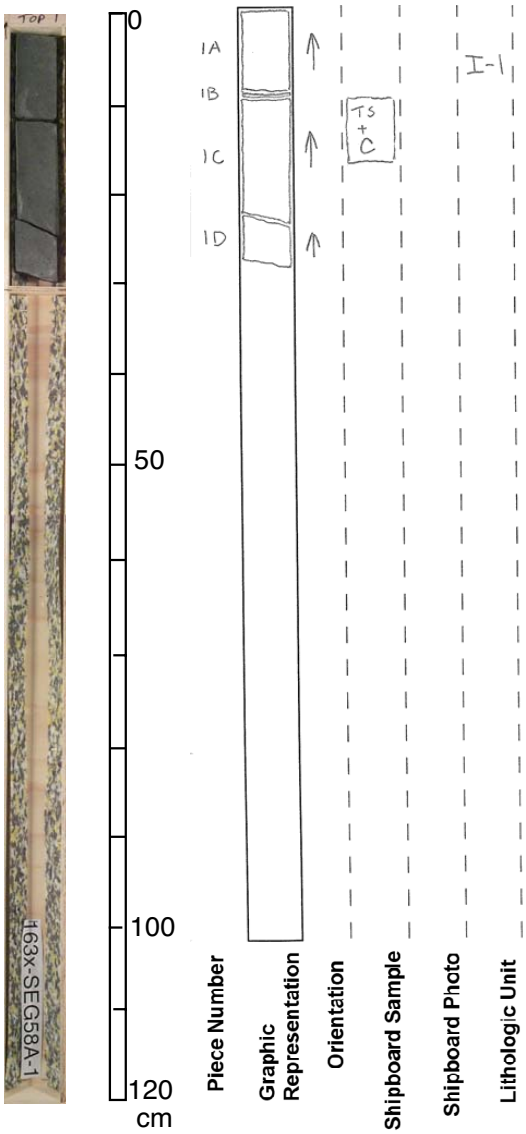
ODP LEG 163X UNIT SUMMARIES **163X-SEG58A-1-1, 0-27**

Transect EG65

Interval 0 - 27 cm **Depth Interval** 0-.27 mbsf

Unit I-1

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	7	2
olivine	2	1
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	0
olivine	subhedral/euhedral	50
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Small irregular vesicles filled with green clays, < 1 mm in diameter

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture fracturing at ca. 70 - 90 degress, relative to the core axis

Unit Summary

Fine-grained, moderately plagioclase-olivine-clinopyroxene phyric and glomerophyric basalt.

Core Photo

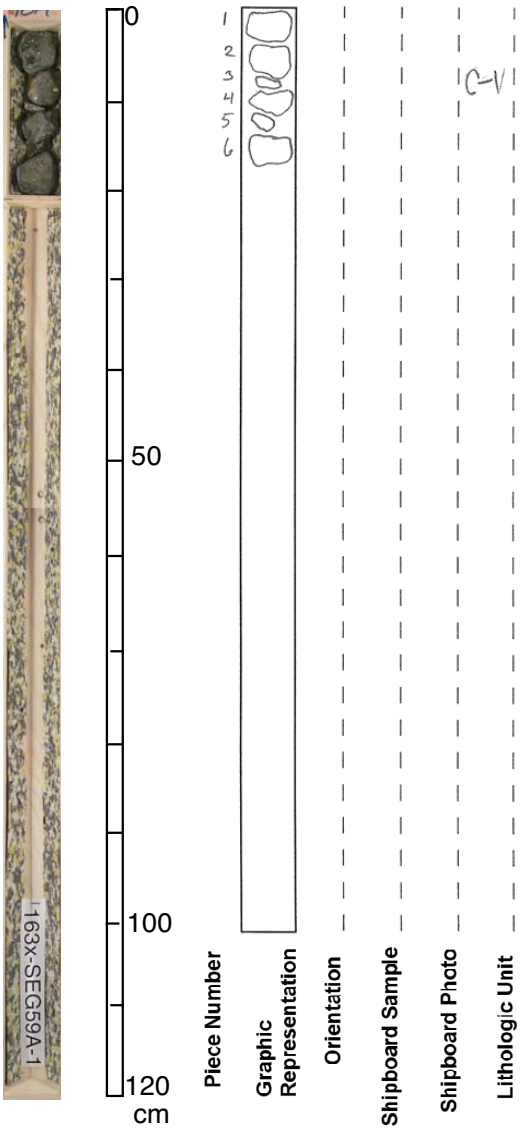
ODP LEG 163X UNIT SUMMARIES **163X-SEG59A-1-1, 0-16**

Transect EG65

Interval 0 - 16 cm **Depth Interval** 0-.16 mbsf

Unit C-1

Rock sparsely clinopyroxene-plagioclase phyric basaltic gravel



Phenocrysts	Modal %	Size mm
plagioclase	1	
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
plagioclase		
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene, in an intergranular fabric.

Vesicles Ellipsiod amygdules, filled with white, not calcite, and green minerals, 1-3 mm.

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Subangular basaltic and gneissic clasts, 1 to 4 cm large.

Core Photo

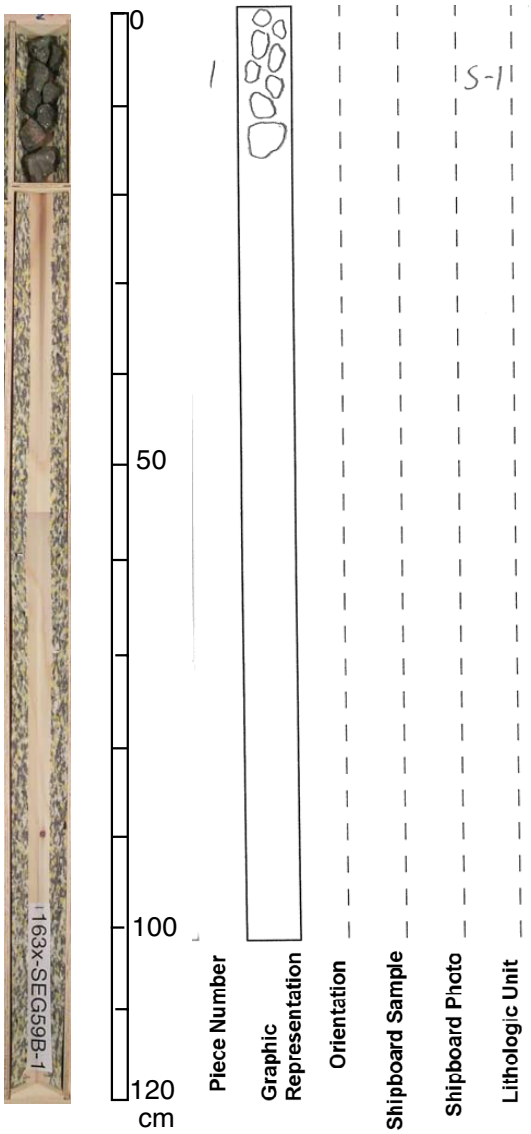
ODP LEG 163X UNIT SUMMARIES **163X-SEG59B-1-1, 0-16**

Transect EG65

Interval 0 - 16 cm **Depth Interval** 0-.16 mbsf

Unit S-1

Rock sparsely clinopyroxene-plagioclase phyric basaltic gravel



Phenocrysts	Modal %	Size mm
plagioclase	1	
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
plagioclase		
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Ellipsiodal amygduals filled with white and green minerals, 1-3 mm.

Color grey

Structure

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Basaltic and granitic clasts. Size of clasts range from 1 to 3 cm. Matrix mud is not preserved.

Core Photo

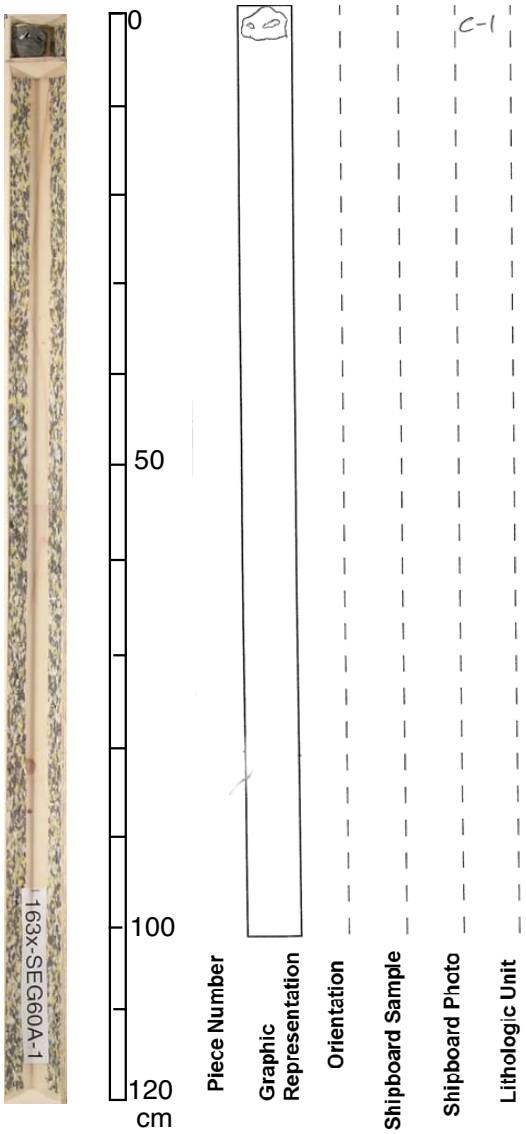
ODP LEG 163X UNIT SUMMARIES **163X-SEG60A-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit C-1

Rock highly plagioclase-olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	4	1-2
plagioclase	10	1-30

Phenocrysts	Shape	Alteration %
olivine	prismatic-subhedral	100
plagioclase	tabular	10

Groundmass Composed of plagioclase, clinopyroxene, and olivine together with mesostasis in a granular tfabric. The mesostasis has been altered to clays.

Vesicles Vesicles are 1-4 mm in size, located mostly in the top 38 cm of the core. Some are circular, others are irregularly shaped.

Color grey

Structure clast

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Basaltic pebble.

Core Photo

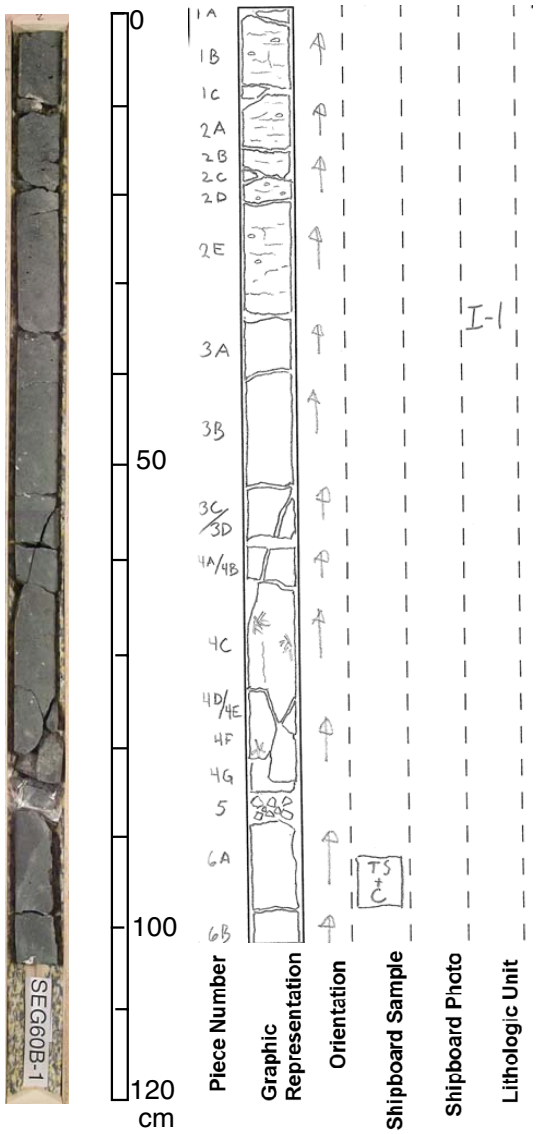
ODP LEG 163X UNIT SUMMARIES **163X-SEG60B-1-1, 0-103**

Transect EG65

Interval 0 - 103 cm **Depth Interval** 0-1.03 mbsf

Unit I-1

Rock highly plagioclase-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	4	1-2
plagioclase	10	1-30

Phenocrysts	Shape	Alteration %
olivine	prismatic-subhedral	100
plagioclase	tabular	10

Groundmass Composed of plagioclase, olivine, clinopyroxene, and mesostasis in a granular fabric. Mesostasis areas are altered to clays.

Vesicles Vesicles are 1-4 mm in size and located mostly in the top 38 mm of the core. Some are circular, others are irregularly shaped. Piece 6B contains large, irregular, partially filled vugs (0.5- 4 cm) with white cubic mineral and tiny green botryoidal mineral.

Color dark grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture Pieces 1 and 2, contain a fine network of irregular narrow viens that are filled with white mineral.

Unit Summary

Fine-grained, amygdaloidal, highly plagioclase-olivine phyric and intersertal basalt.

Core Photo

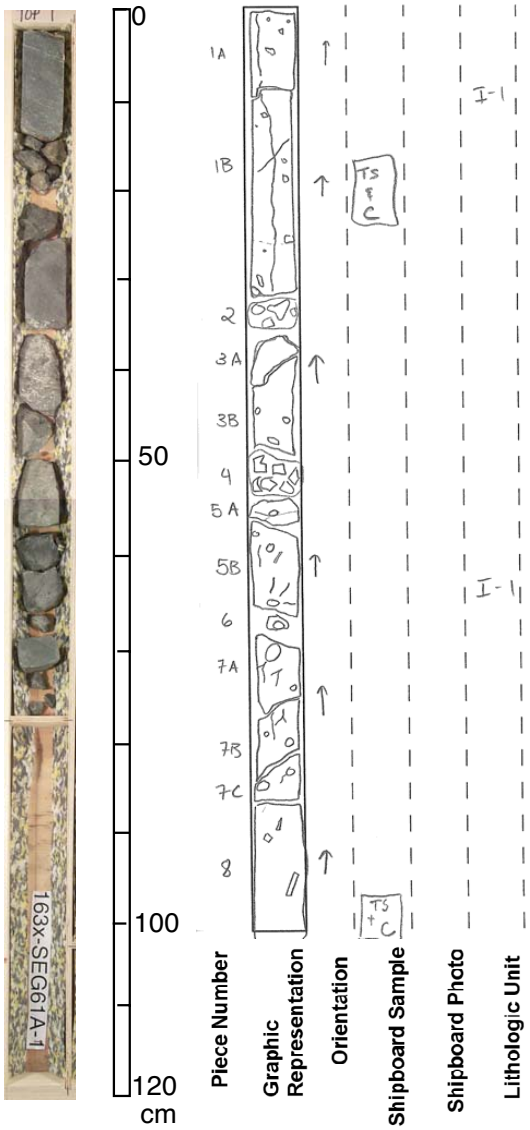
ODP LEG 163X UNIT SUMMARIES **163X-SEG61A-1-1, 0-13**

Transect EG65

Interval 0 - 13 cm **Depth Interval** 0-.13 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Foliated gneiss clast with vith various forms of benthic organisms growing on the top weathered surface.

Core Photo

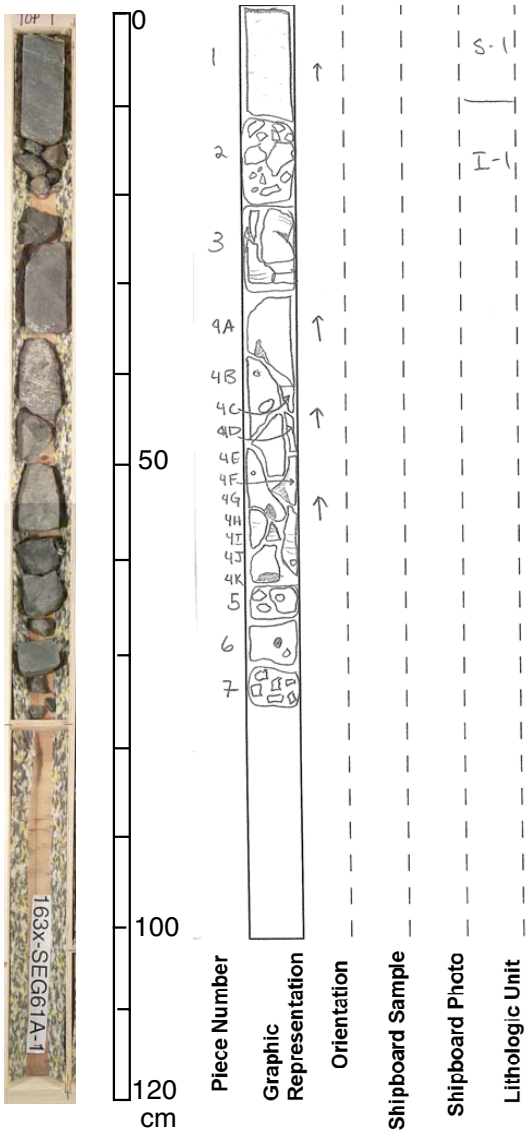
ODP LEG 163X UNIT SUMMARIES **163X-SEG61A-1-1, 13-75**

Transect EG65

Interval 13 - 75 cm **Depth Interval** .13-.75 mbsf

Unit I-1

Rock moderately clinopyroxene-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	1	1
clinopyroxene	3	2-3

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
clinopyroxene	subhedral	

Groundmass intergranular with clinopyroxene and plagioclase

Vesicles Vesicles and amygduals are 2-4 mm in diameters. Some amygduals are filled with white mineral and rimmed with a dark green mineral, while others are filled with green clays.

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Irregular fractures are present and are unfilled.

Unit Summary

Fine-grained, amygdaloidal, moderately clinopyroxene-olivine phyric basalt.

Core Photo

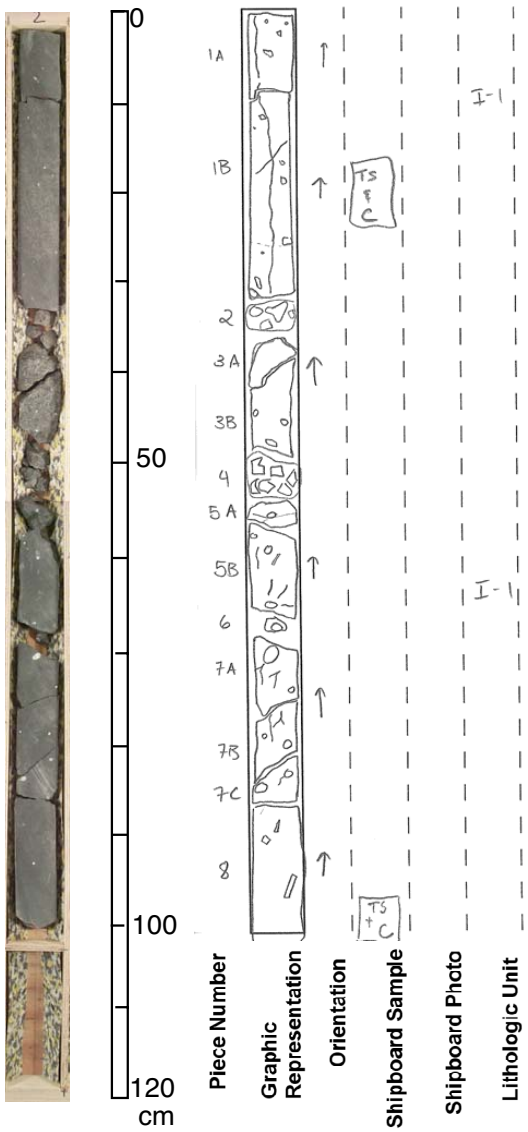
ODP LEG 163X UNIT SUMMARIES **163X-SEG61B-1-1, 0-102**

Transect EG65

Interval 0 - 102 cm **Depth Interval** 0-1.02 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	3	2-4
plagioclase	2	2-6
olivine	trace	

Phenocrysts	Shape	Alteration %
clinopyroxene	prismatic	
plagioclase	lath	
olivine		

Groundmass Groundmass composed of mainly clinopyroxene and plagioclase in a granular fabric. Olivine is also present in trace amounts.

Vesicles Vesicles are found sparsely throughout the top 68 cm of the core. They are generally small, about 1 mm in diamter and are circular. Amygduals are much larger, 2-8 mm in diameter.

Color dark grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Irregular fractures throughout are filled with a white mineral. Long thin fracture, parallel to the axis of the core extends from the top of Section 1 to the bottem of Piece 1B in Section 1.

Unit Summary

Fine-grained, veiscular, moderately clinopyroxene phyric basalt. Thin section study indicate that the unit is moderately plagioclase-clinopyroxene-(+/-olivine) phyric.

Core Photo

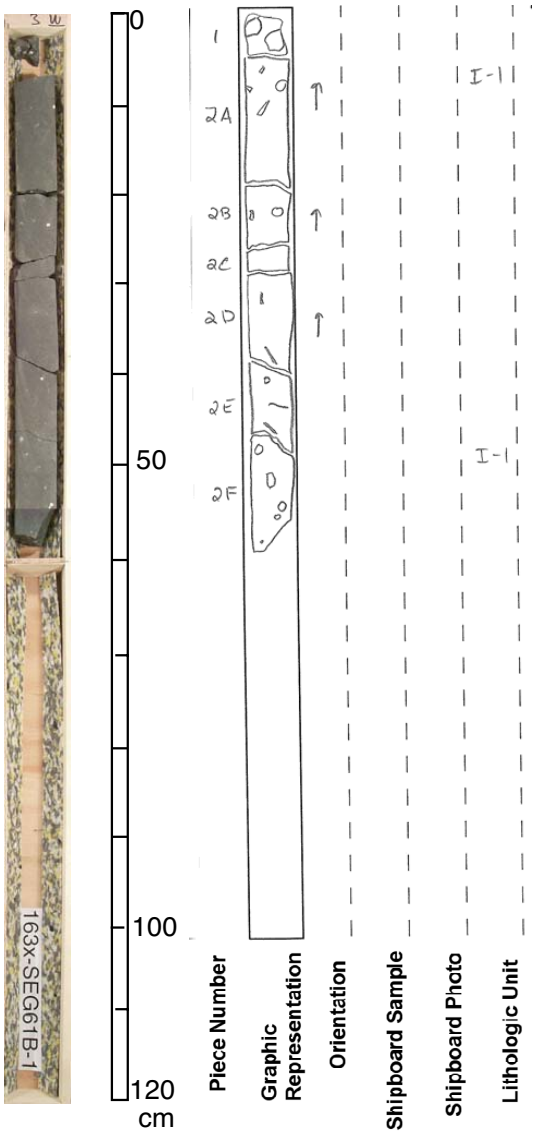
ODP LEG 163X UNIT SUMMARIES **163X-SEG61B-1-2, 0-59**

Transect EG65

Interval 0 - 59 cm **Depth Interval** 0-.59 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
clinopyroxene	3	2-4
plagioclase	2	2-6
olivine	trace	

Phenocrysts	Shape	Alteration %
clinopyroxene	prismatic	
plagioclase	lath	
olivine		

Groundmass Groundmass composed of mainly clinopyroxene and plagioclase in a granular fabric.

Vesicles Vesicles are found sparsely throughout the top 68 cm of the core. They are generally small, about 1 mm in diamter and are circular. Amygduals are much larger, 2-8 mm in diameter.

Color dark grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Irregular fractures throughout are filled with a white mineral. Long thin fracture, parallel to the axis of the core extends from the top of Section1 to the bottem of Piece 1B in Section 1.

Unit Summary

Fine-grained, veiscular, moderately clinopyroxene phyric basalt. Thin section study indicate that the unit is moderately plagioclase-clinopyroxene-(+/-olivine) phyric.

Core Photo

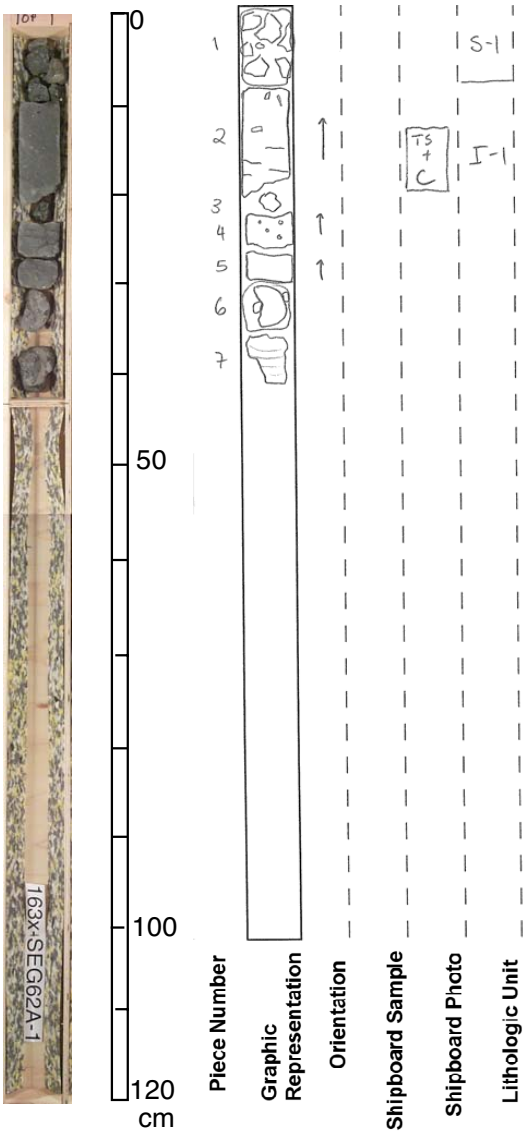
ODP LEG 163X UNIT SUMMARIES **163X-SEG62A-1-1, 0-8.5**

Transect EG65

Interval 0 - 8.5 cm **Depth Interval** 0-.085 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Mostly basaltic pebbles.

Core Photo

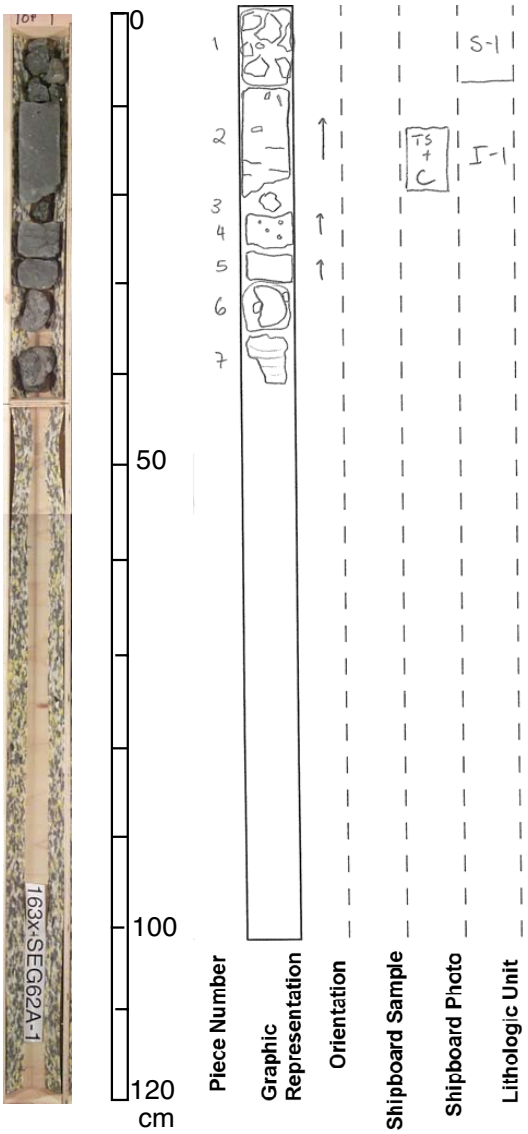
ODP LEG 163X UNIT SUMMARIES **163X-SEG62A-1-1, 8.5-38.5**

Transect EG65

Interval 8.5 - 38.5 cm **Depth Interval** .085-.385 mbsf

Unit I-1

Rock moderately clinopyroxene-plagioclase-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2	1
plagioclase	3	1-3
clinopyroxene	3	1-3

Phenocrysts	Shape	Alteration %
olivine	equant-prismatic	100
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of clinopyroxene, olivine and plagioclase.

Vesicles Vesicles found throughout, 1-2 mm in diamter. One amygdual in Piece 2 is filled with a white mineral.

Color grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture Fractures present are filled with white and black minerals.

Unit Summary

Fine-grained, vesicular, moderately clinopyroxene-plagioclase-olivine phyric basalt.

Core Photo

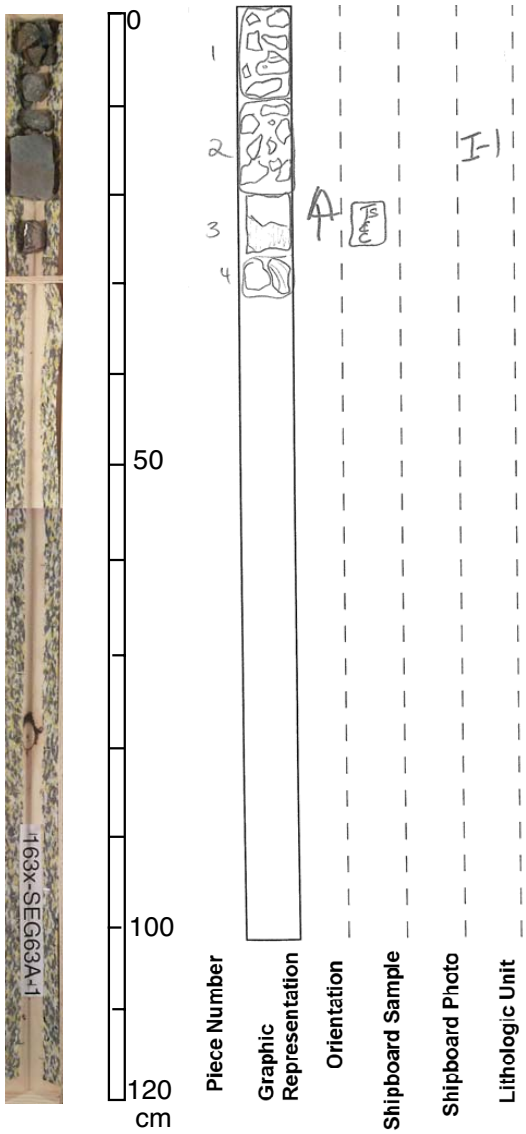
ODP LEG 163X UNIT SUMMARIES **163X-SEG63A-1-1, 0-30**

Transect EG65

Interval 0 - 30 cm **Depth Interval** 0-.3 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	100
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Vesicles are 1-2 mm large and very irregularly shaped.

Color grey to brown

Structure clast

Alteration highly (40-80%)

Vein/fracture Fractures are filled w/ a white mineral.

Unit Summary

Fine-grained, vesicular to glomerophyric, moderately olivine-clinopyroxene phyric basalt.

Core Photo

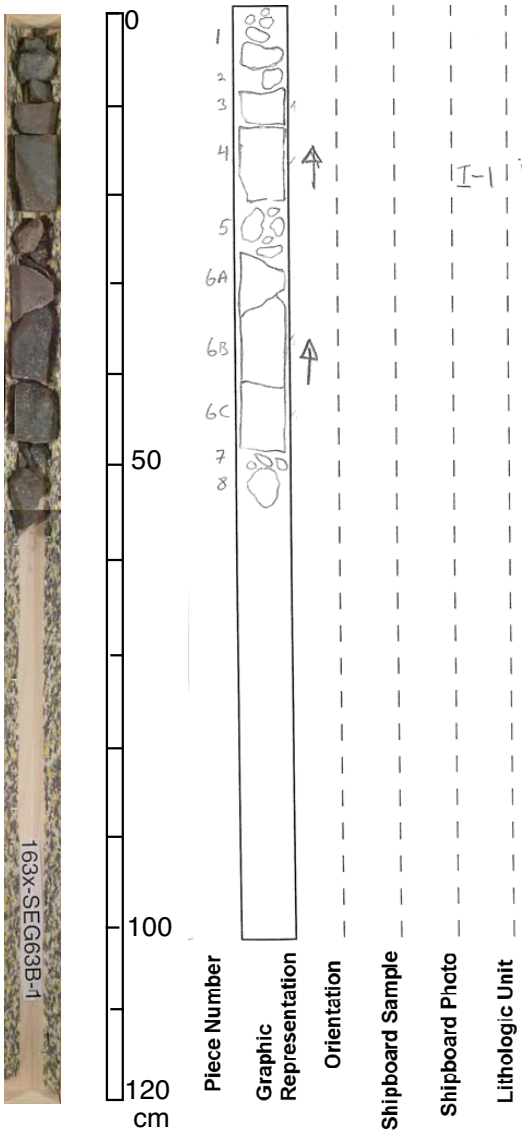
ODP LEG 163X UNIT SUMMARIES **163X-SEG63B-1-1, 0-55**

Transect EG65

Interval 0 - 55 cm **Depth Interval** 0-.55 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
olivine	sub- to anhedral	100
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene, and olivine in an intergranular fabric.

Vesicles Vesicles are 1-2 mm, some are empty, others are filled with carbonate and other white minerals, some are filled with reddish-brown clays.

Color grey brown

Structure

Alteration highly (40-80%)

Vein/fracture The unit is highly fractured and is broken into many pieces, alteration minerals are seen along fractures.

Unit Summary

Fine-grained, amygdaloidal, moderately olivine-clinopyroxene phyric basalt with rusty brown weathering.

Core Photo

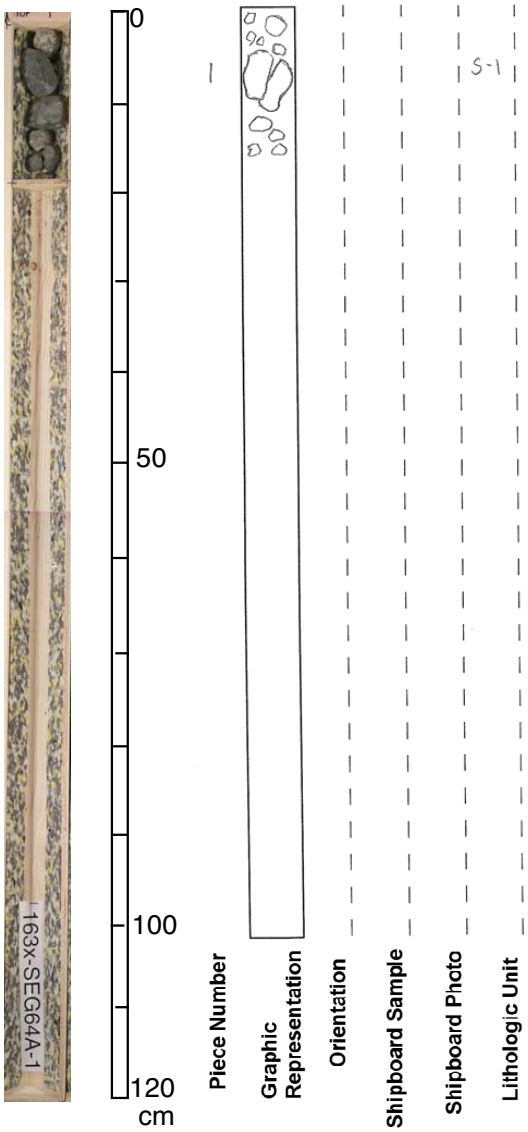
ODP LEG 163X UNIT SUMMARIES **163X-SEG64A-1-1, 0-17**

Transect EG65

Interval 0 - 17 cm **Depth Interval** 0-.17 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subangular to rounded clasts consisting of basalt, granite, and sandstone.

Core Photo

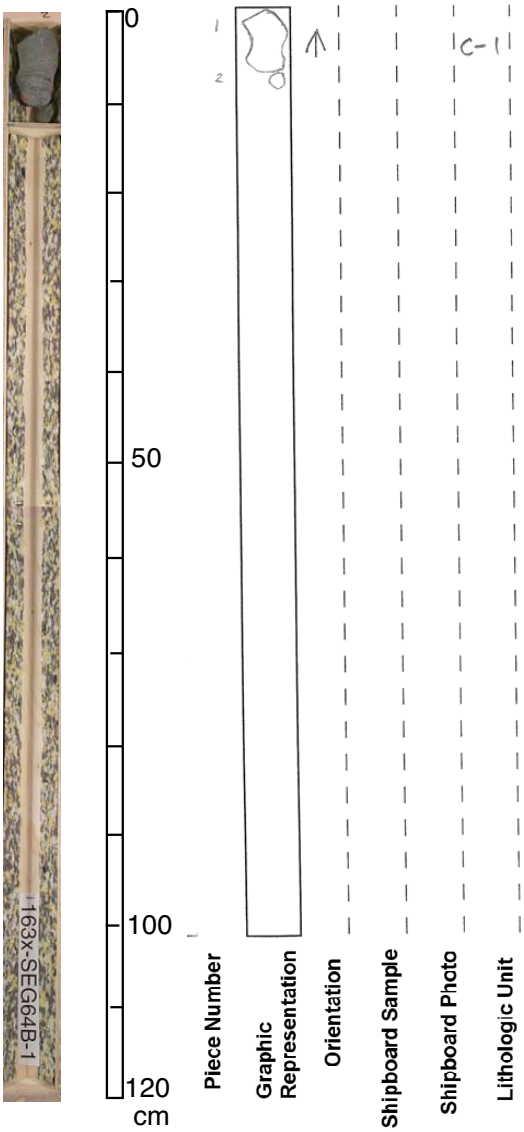
ODP LEG 163X UNIT SUMMARIES **163X-SEG64B-1-1, 0-8**

Transect EG65

Interval 0 - 8 cm **Depth Interval** 0-.08 mbsf

Unit C-1

Rock moderately plagioclase-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
plagioclase	3	1
clinopyroxene	2	1

Phenocrysts	Shape	Alteration %
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of pplagioclase and clinopyroxene in an intergranular fabric.

Vesicles

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Cored basalt fragment stuck in core catcher.

Core Photo

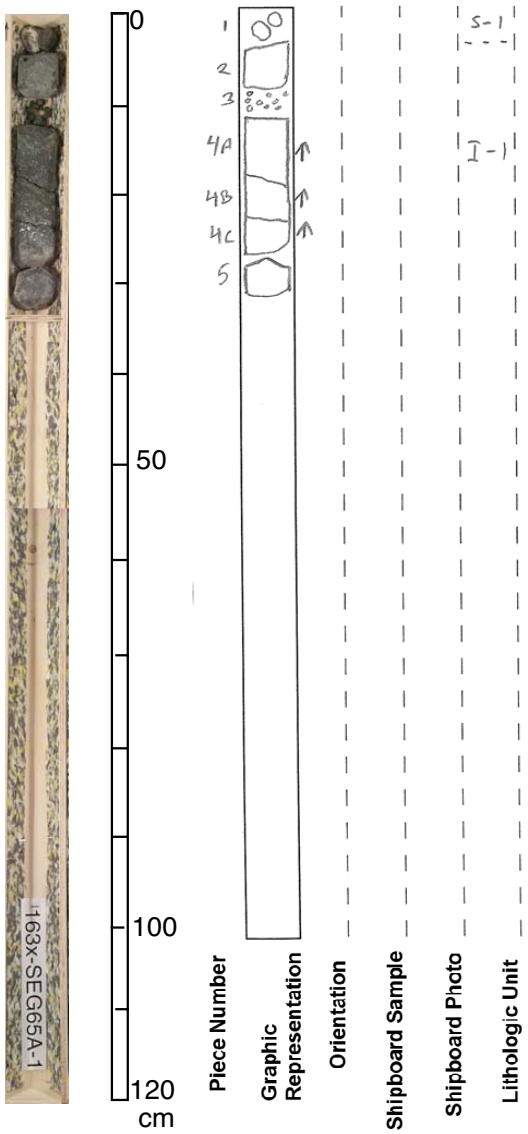
ODP LEG 163X UNIT SUMMARIES **163X-SEG65A-1-1, 0-4**

Transect EG65

Interval 0 - 4 cm **Depth Interval** 0-.04 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Two clasts composed of granite and basalt (2 cm long).

Core Photo

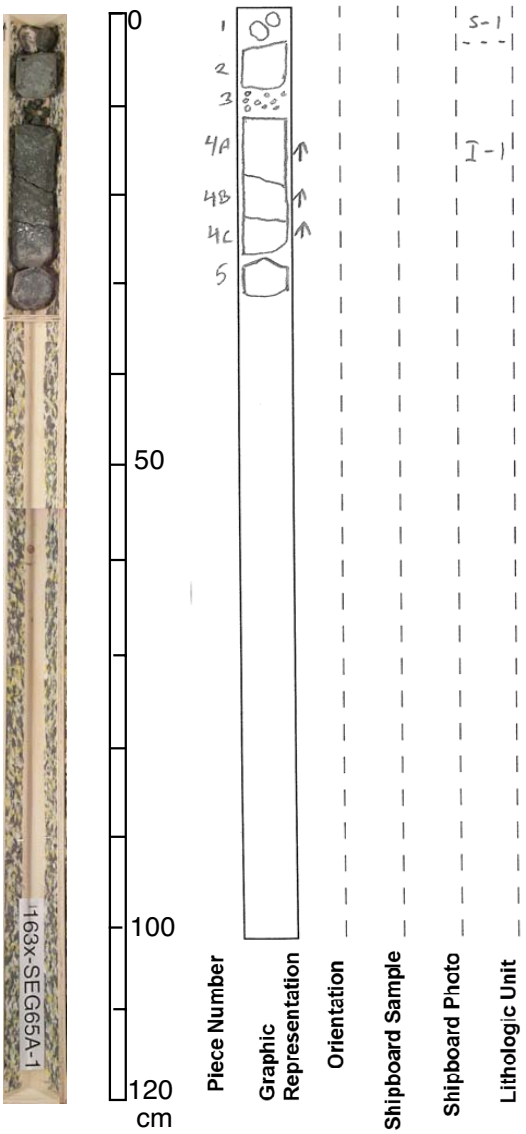
ODP LEG 163X UNIT SUMMARIES **163X-SEG65A-1-1, 4-31**

Transect EG65

Interval 4 - 31 cm **Depth Interval** .04-.31 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	4	1
plagioclase	2	2
clinopyroxene	3	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene.

Vesicles filled with carbonate and other white and green minerals

Color grey

Structure massive

Alteration

Vein/fracture One large fracture almost parallel with the coring direction. Fracturing also at right angles to core axis.

Unit Summary

Fine-grained, amygdaloidal, moderately olivine-clinopyroxene-plagioclase phyric basalt.

Core Photo

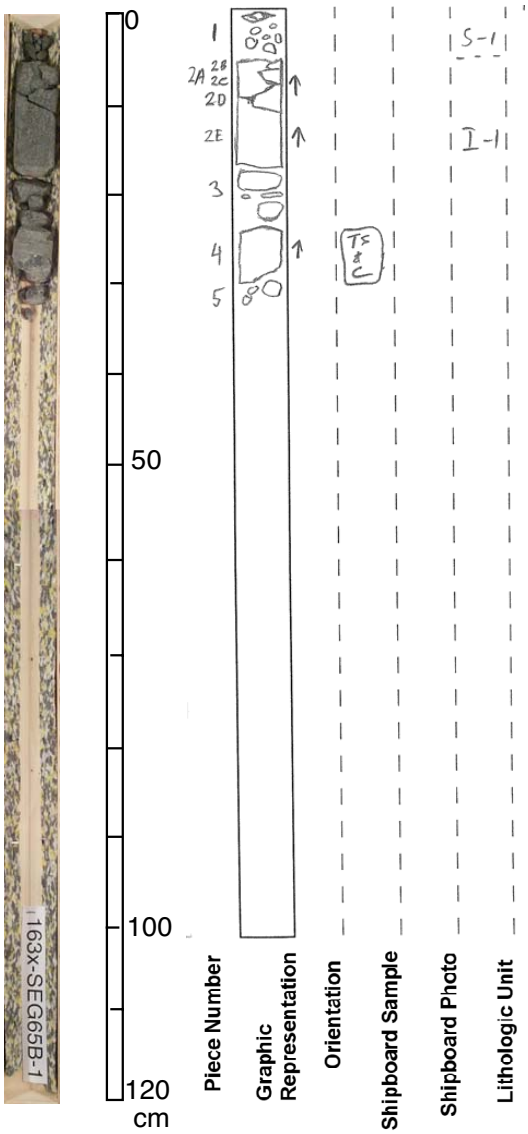
ODP LEG 163X UNIT SUMMARIES **163X-SEG65B-1-1, 0-4**

Transect EG65

Interval 0 - 4 cm **Depth Interval** 0-.04 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Small basaltic and gneissic clasts (<1 cm) and a 2.4 cm long unidentified snail shell.

Core Photo

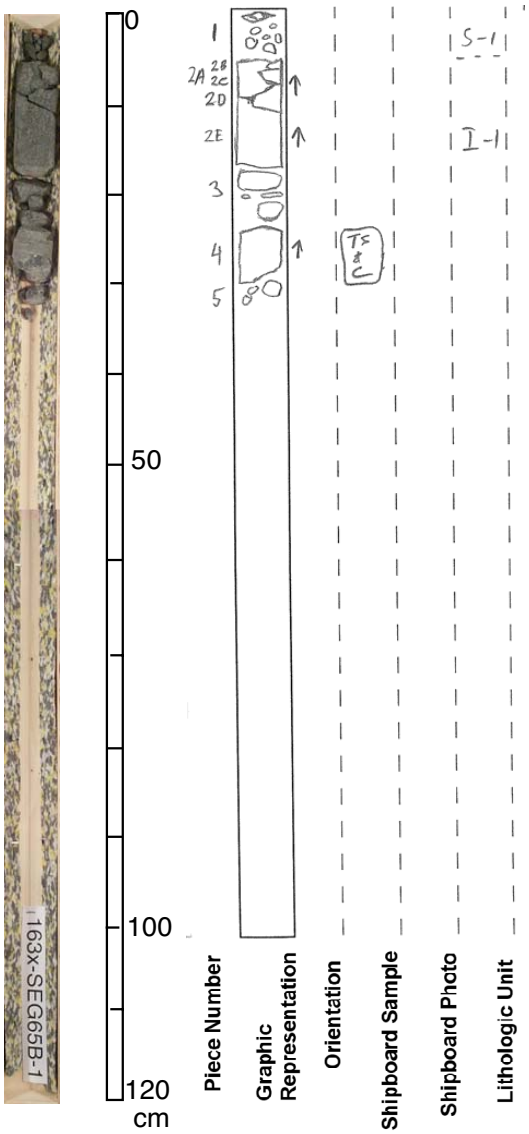
ODP LEG 163X UNIT SUMMARIES **163X-SEG65B-1-1, 4-31**

Transect EG65

Interval 4 - 31 cm **Depth Interval** .04-.31 mbsf

Unit I-1

Rock moderately olivine-clinopyroxene-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	5	1-2
plagioclase	2	1
clinopyroxene	3	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Intergranular groundmass of clinopyroxene and plagioclase.

Vesicles

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Fine-grained, moderately olivine-clinopyroxene-plagioclase phyric and glomerophyric basalt.

Core Photo

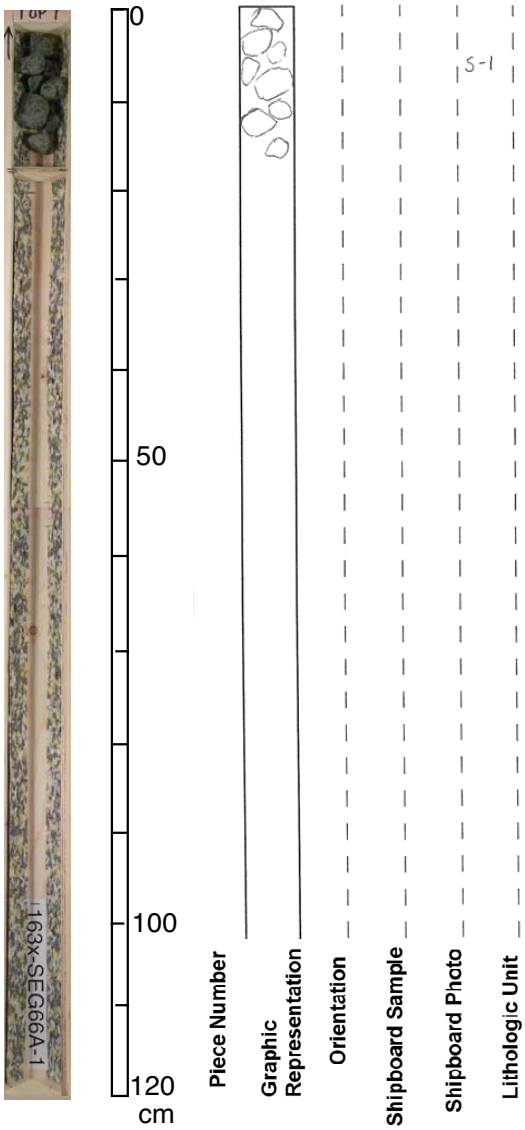
ODP LEG 163X UNIT SUMMARIES **163X-SEG66A-1-1, 0-16**

Transect EG65

Interval 0 - 16 cm **Depth Interval** 0-.16 mbsf

Unit S-1

Rock moderately plagioclase-clinopyroxene phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	<1	<1
plagioclase	3	1
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	10
plagioclase	lath	
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Vesicles are mostly unfilled, ca. 2 mm in diameter and irregular,. Some are filled with green to grey clay.

Color grey

Structure clast

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Basaltic pebbles, subangular, 2 to 4 cm in diameter, apparently all of same composition. Could be scree from top of lava flow.

SEG73A-1 No recovery

Core Photo

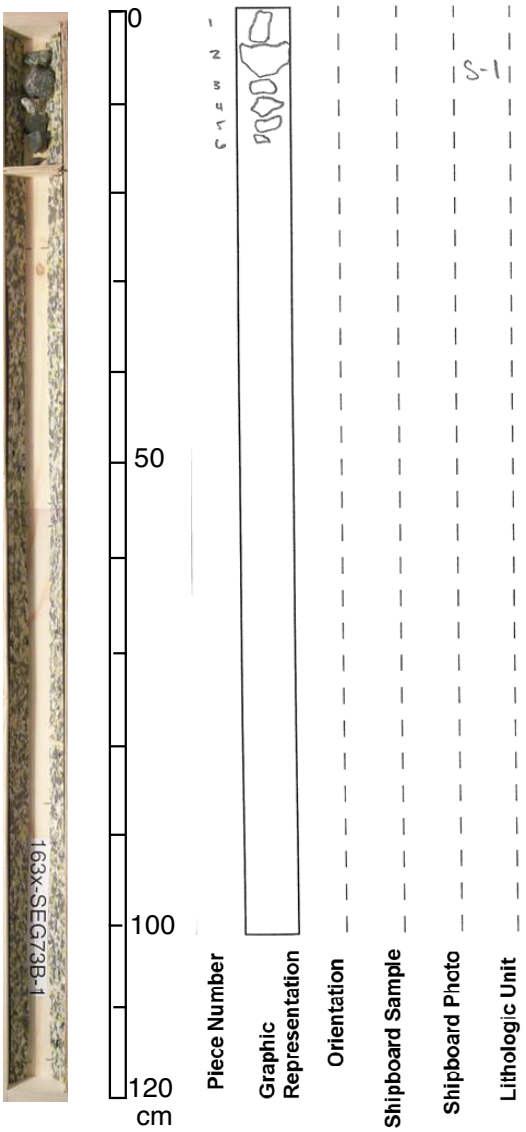
ODP LEG 163X UNIT SUMMARIES **163X-SEG73B-1-1, 0-14**

Transect EG65

Interval 0 - 14 cm **Depth Interval** 0-.14 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Rounded to subangular clasts ranging in composition from gneiss to basalt and in size from 1-4 cm.

Core Photo

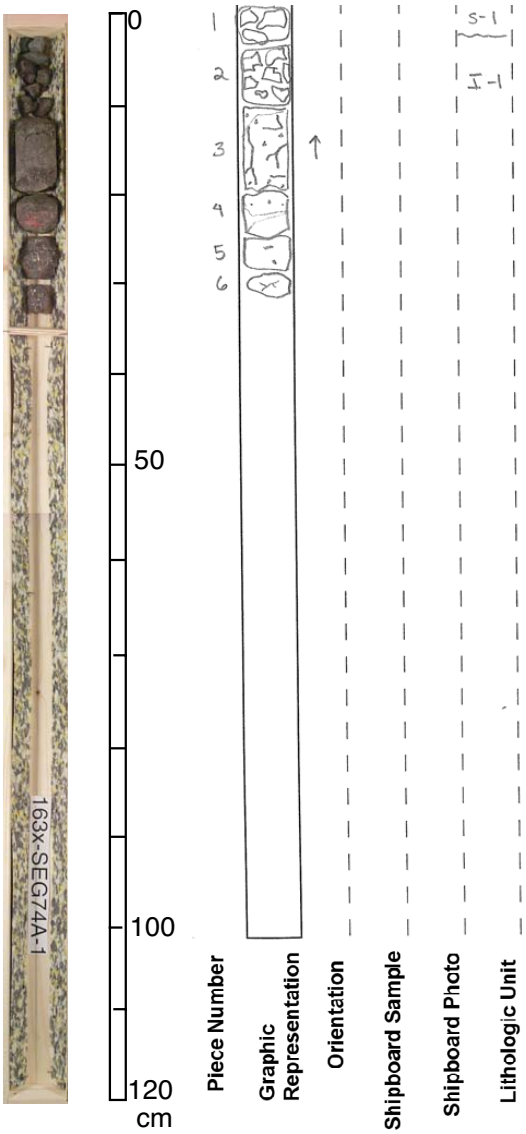
ODP LEG 163X UNIT SUMMARIES **163X-SEG74A-1-1, 4-31**

Transect EG65

Interval 4 - 31 cm **Depth Interval** .04-.31 mbsf

Unit I-1

Rock highly olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	35	1-4

Phenocrysts	Shape	Alteration %
olivine	equant to prismatic	80

Groundmass Groundmass generally unaltered. Composed of clinopyroxene, plagioclase, and olivine in a granular fabric.

Vesicles no vesicles or amygdales.

Color grey

Structure massive

Alteration highly (40-80%)

Vein/fracture Fractures occur frequently. Filled with red alteration, clay and occassionally lined with a black mineral.

Unit Summary

Massive, nonvesicular, highly olivine phyric basalt with strong orange colouration from weathering. Almost all phenocrysts are altered to red clay materials. Fractures occur frequently and are filled with red alteration clay and occassionally lined with a black mineral.

Core Photo

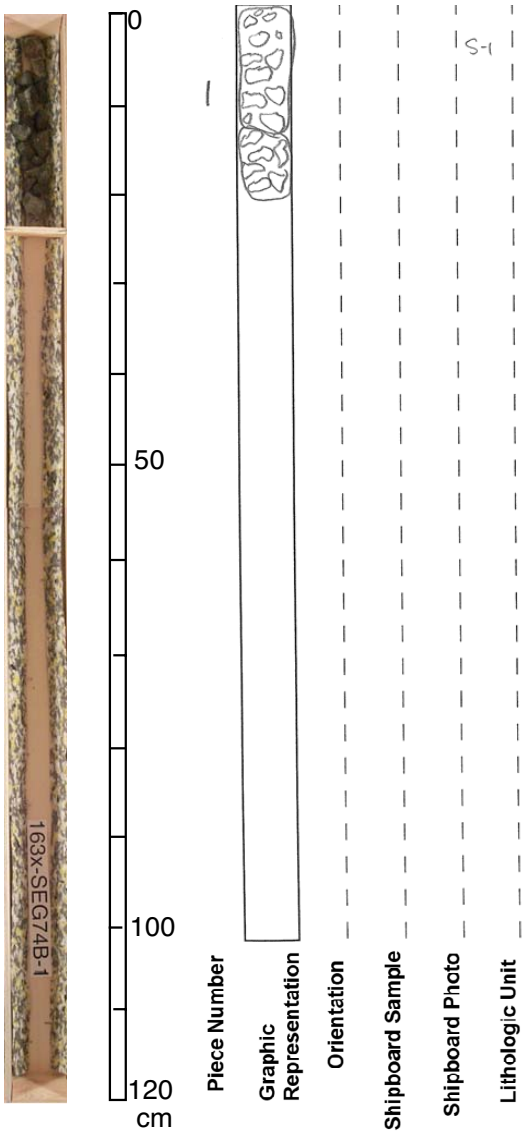
ODP LEG 163X UNIT SUMMARIES **163X-SEG74B-1-1, 0-21**

Transect EG65

Interval 0 - 21 cm **Depth Interval** 0-.21 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

C;lasts ranging in compositions from basalt to gneiss to a very felsic rock (metamorphic quatzite). Subangular to subrounded. Two clasts have similar composition to Unit I-1 from SEG74A.

SEG74C-1 No recovery

Core Photo

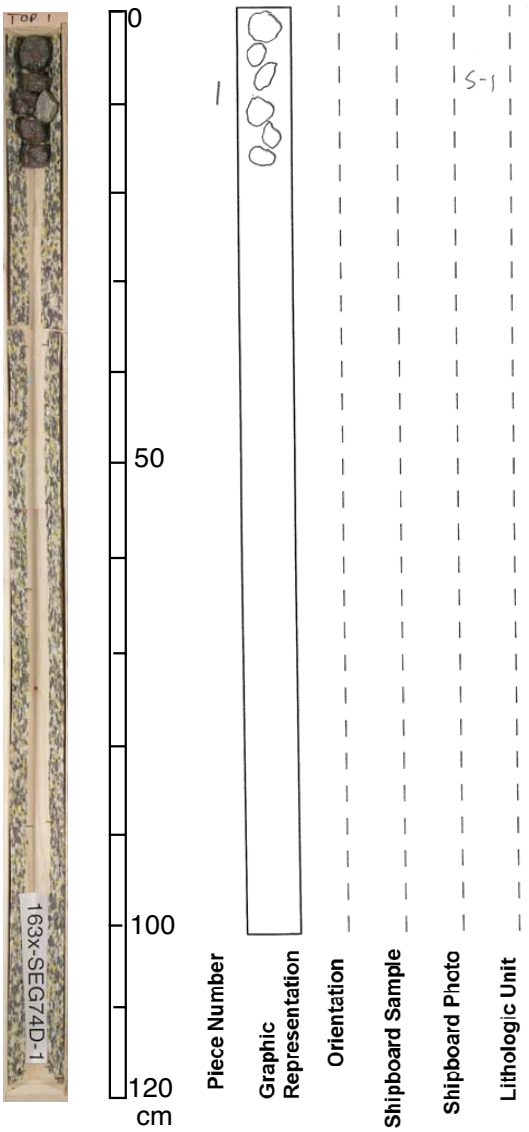
ODP LEG 163X UNIT SUMMARIES **163X-SEG74D-1-1, 0-4**

Transect EG65

Interval 0 - 4 cm **Depth Interval** 0-.04 mbsf

Unit S-1

Rock sparsely plagioclase-clinopyroxene phyric basaltic gravel



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color grey

Structure clast

Alteration

Vein/fracture

Unit Summary

Sparsely plagioclase-clinopyroxene phyric basalt fragments different in composition from the Unit I-1 basalt. Additionally, there is no red weathering features.

Core Photo

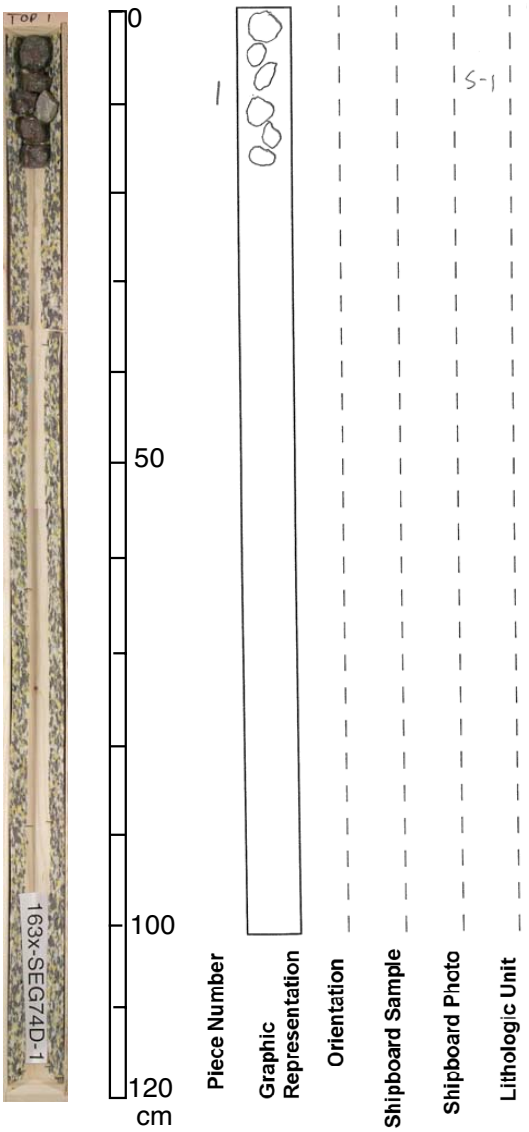
ODP LEG 163X UNIT SUMMARIES **163X-SEG74D-1-1, 0-17**

Transect EG65

Interval 0 - 17 cm **Depth Interval** 0-.17 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Large pebbles of basalt and sandstone. The sandstone consists mainly of quartz and mica. The basaltic pebbles are very weathered, red stained and moderately olivine phyric (about 10% olivine). Olivine phenocrysts are approximately 2 mm in diameter and all altered to a green mineral and iddingsite. Amygdules are about 1 mm, ellipsoidal and filled with green minerals and have red stains.

Core Photo

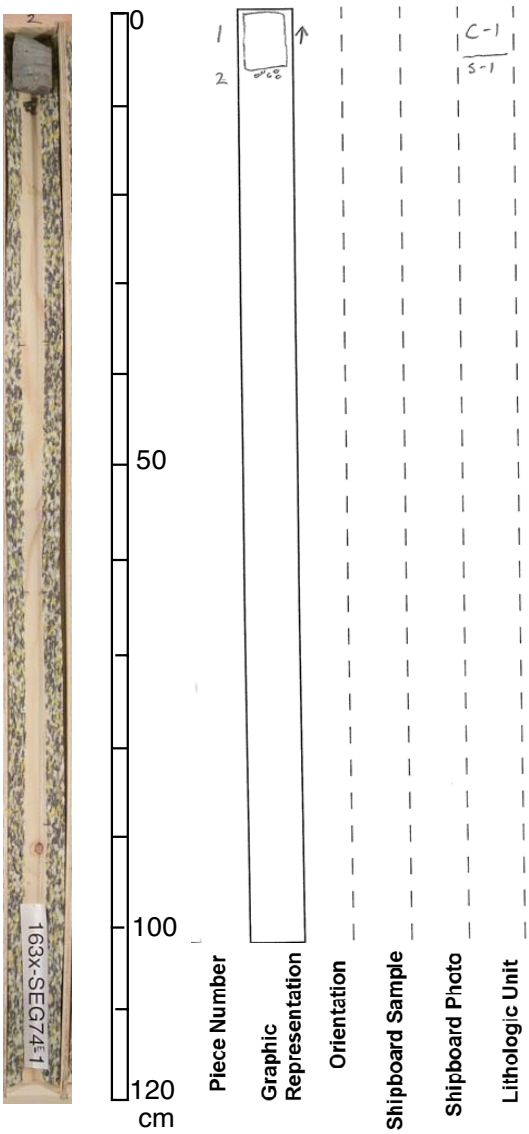
ODP LEG 163X UNIT SUMMARIES **163X-SEG74E-1-1, 0-7**

Transect EG65

Interval 0 - 7 cm **Depth Interval** 0-.07 mbsf

Unit C-1

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	2	1
plagioclase	5	2
clinopyroxene	1	<1

Phenocrysts	Shape	Alteration %
olivine	subhedral	10
plagioclase	subhedral	
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles Vesicles are about 0.5 to 2 mm in diameter, most commonly unfilled although some have white zeolite fillings. Small vesicles occur in irregular swarms.

Color light grey

Structure massive

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Moderately plagioclase-olivine-clinopyroxene phyric basalt with about 5 % plagioclase, 2 % olivine, and 1 % clinopyroxene. Plagioclase and clinopyroxene form glomerocrysts, occasionally with olivine. Vesicles are about 0.5 to 2 mm in diameter, most commonly unfilled although some have white zeolite fillings. Small vesicles occur in irregular swarms.The rock is slightly red stained, but altered parts do not seem to penetrate deeper than 2 mm.

Core Photo

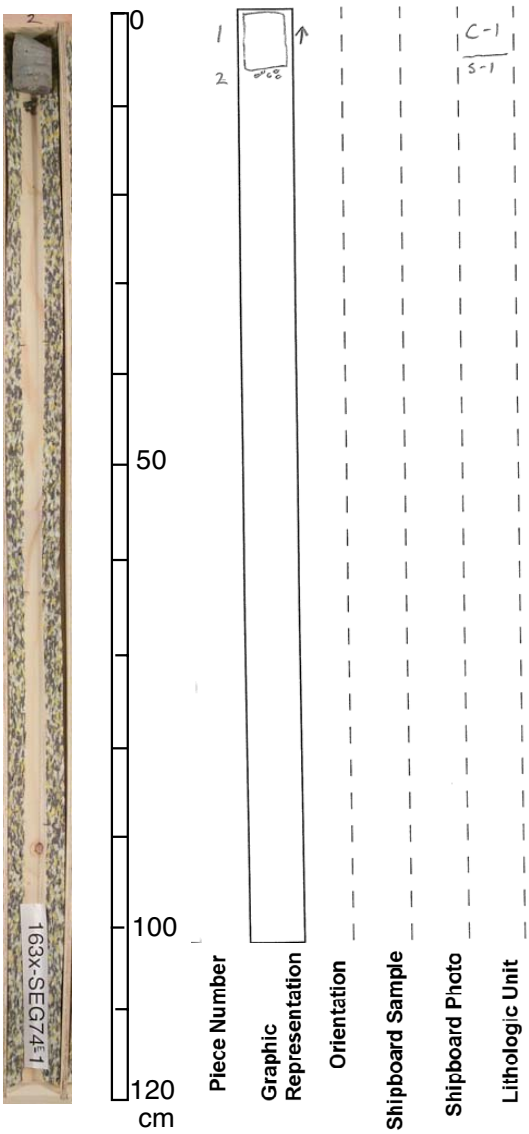
ODP LEG 163X UNIT SUMMARIES **163X-SEG74E-1-1, 7-7.5**

Transect EG65

Interval 7 - 7.5 cm **Depth Interval** .07-.075 mbsf

Unit S-1

Rock basaltic gravel



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color dark grey

Structure

Alteration

Vein/fracture

Unit Summary

Basaltic fragments with an appearance similar to other red stained basalts from SEG74.

Core Photo

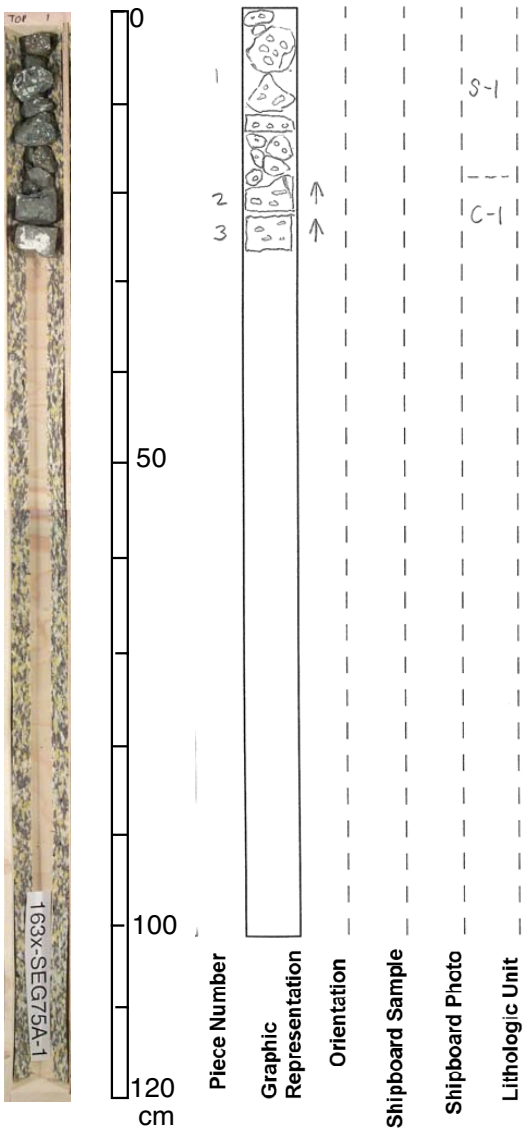
ODP LEG 163X UNIT SUMMARIES **163X-SEG75A-1-1, 0-22**

Transect EG65

Interval 0 - 22 cm **Depth Interval** 0-.22 mbsf

Unit S-1

Rock highly olivine-clinopyroxene phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1-2
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Amygdules are most often lined with a dark green mineral (epidote?) and filled with clays, carbonate and zeolites. Sizes around 1-4 mm, shaped irregularly rounded to ellipsiodal.

Color grey green

Structure

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Highly olivine-clinopyroxene phyric and amygdaloidal basaltic gravel, very highly altered. Amygdules are most often lined with a dark green mineral (epidote?) and filled with clays, carbonate and zeolites. Composition similar to C-1 of SEG75A.

Core Photo

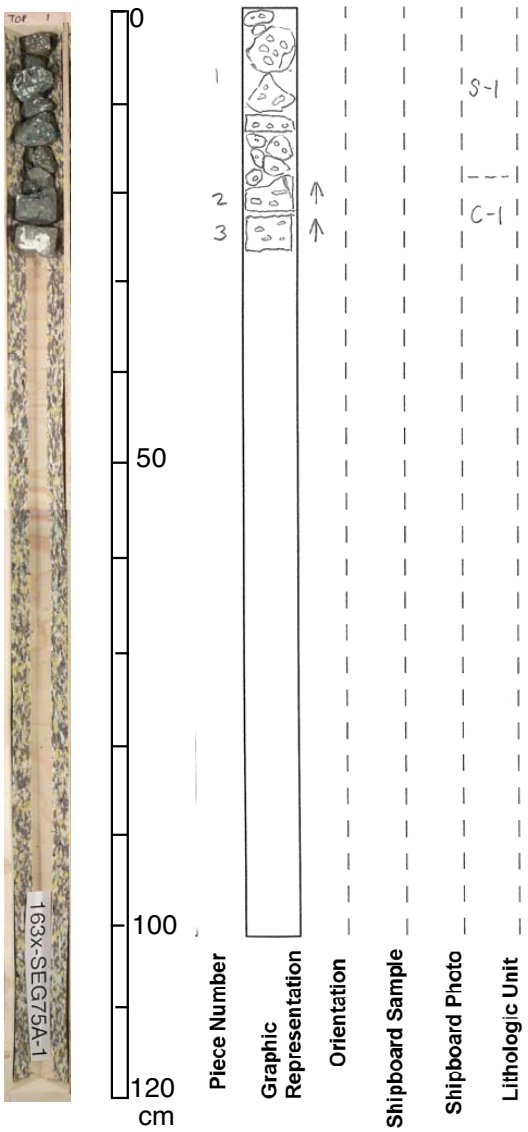
ODP LEG 163X UNIT SUMMARIES **163X-SEG75A-1-1, 22-26**

Transect EG65

Interval 22 - 26 cm **Depth Interval** .22-.26 mbsf

Unit C-1

Rock highly olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	10	1-2
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Amygdulas most often lined with a dark green mineral, possibly epidote, and filled with pale green to white clays, carbonate and zeolites. Sizes around 1-4 mm and shaped as irregular round to ellipsoidal vesicles.

Color grey green

Structure massive

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Highly olivine-clinopyroxene phyric and amygdaloidal basalt, very highly altered. All olivine has been replaced by green clays and iddingsite. Amygdules are most often lined with a dark green mineral (epidote?) and filled with clays, carbonate and zeolites. The high content of amygdules may be an indication that this core represents a flow top, possibly of a pahoehoe-type lava flow.

Core Photo

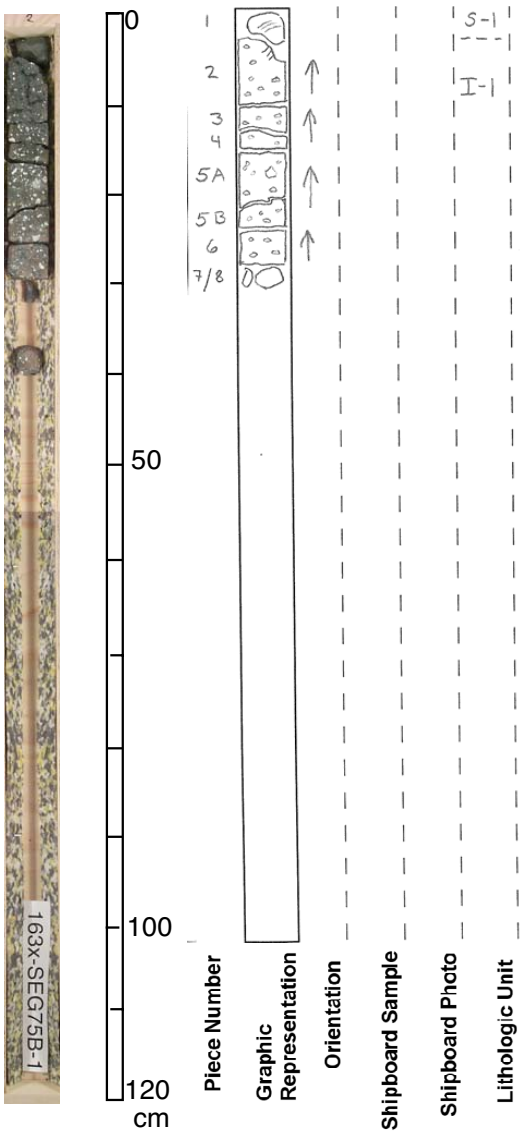
ODP LEG 163X UNIT SUMMARIES **163X-SEG75B-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit S-1

Rock moderately olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	90

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Vesicles are 1-3 mm, rounded irregular shapes and filled with carbonate and green clays.

Color grey

Structure

Alteration moderately (10-40%)

Vein/fracture none

Unit Summary

Moderately olivine phyric basaltic gravel, moderately altered. Most olivine phenocrysts are altered to green clays. Vesicles are 1-3 mm large and filled with carbonate and green clays.

Core Photo

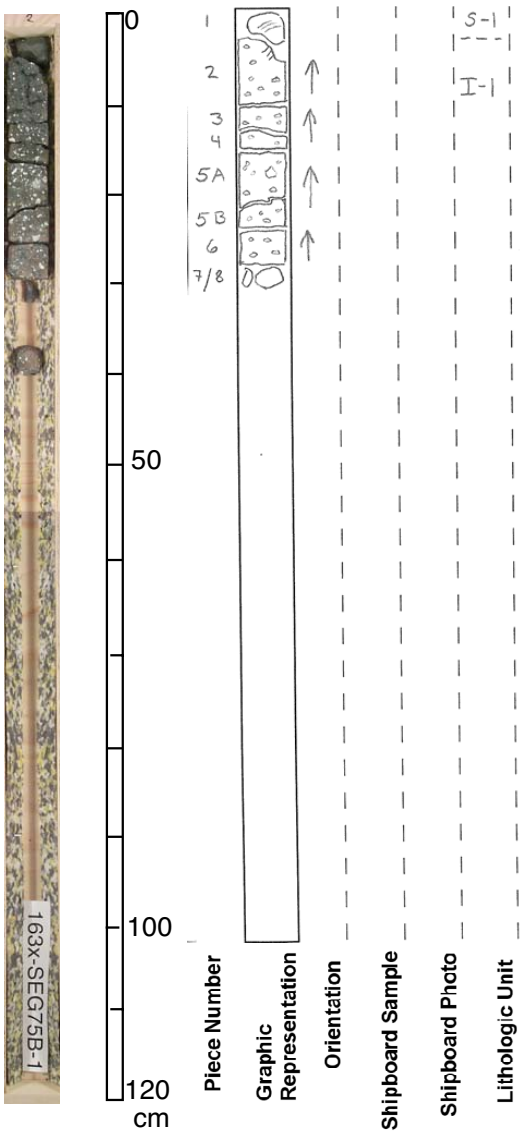
ODP LEG 163X UNIT SUMMARIES **163X-SEG75B-1-1, 3-30**

Transect EG65

Interval 3 - 30 cm **Depth Interval** .03-.3 mbsf

Unit I-1

Rock highly olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	10	1-2
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Amygdules most often lined with a dark green mineral, possibly epidote, and filled with pale green to white clays, carbonate and zeolites. Sizes around 1-4 mm and shaped as irregular round to ellipsoidal vesicles.

Color grey green

Structure

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Amygdaloidal, highly olivine-clinopyroxene phyric basalt that is very highly altered. All olivine is altered to green clays and iddingsite. Amygdules are most often lined with a dark green mineral, possibly epidote, and filled with pale green to white clays, carbonate and zeolites.

Core Photo

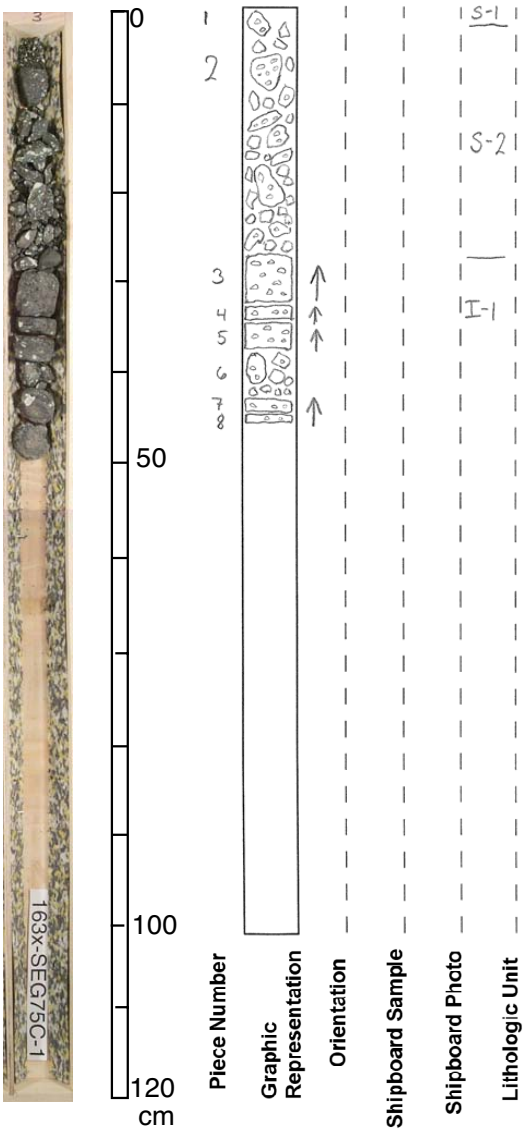
ODP LEG 163X UNIT SUMMARIES **163X-SEG75C-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit S-1

Rock moderately olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1

Phenocrysts	Shape	Alteration %
olivine	subhedral	90

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Vesicles are 1-3 mm, rounded irregular shapes and filled with carbonate and green clays.

Color grey

Structure

Alteration moderately (10-40%)

Vein/fracture none

Unit Summary

Moderately olivine phyric basaltic gravel, moderately altered. Olivine phenocrysts are altered to green clays. Vesicles are 1-3 mm large and filled with carbonate and green clays.

Core Photo

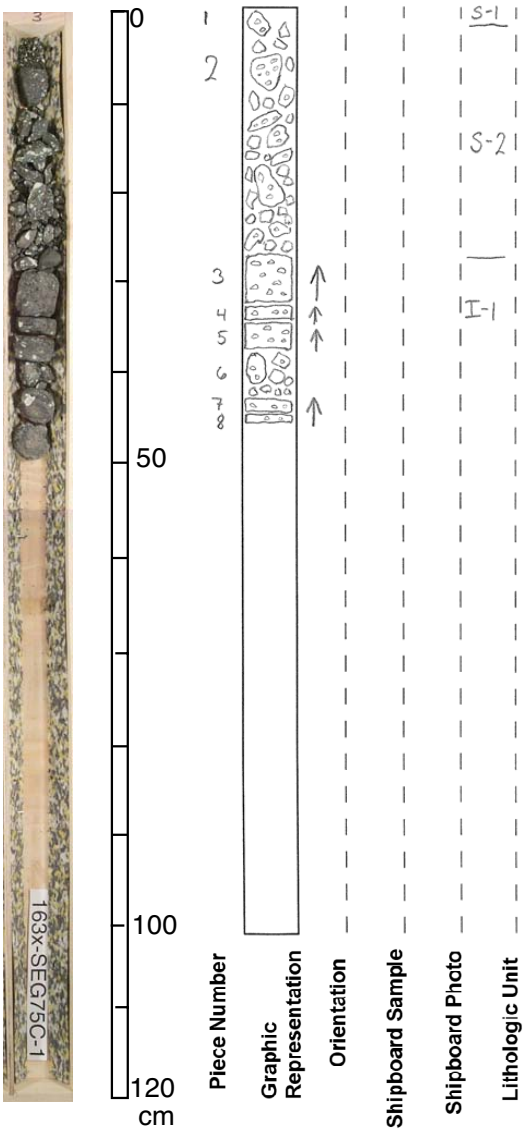
ODP LEG 163X UNIT SUMMARIES **163X-SEG75C-1-1, 0-27**

Transect EG65

Interval 0 - 27 cm **Depth Interval** 0-.27 mbsf

Unit S-2

Rock highly olivine-clinopyroxene phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles

Color grey green

Structure

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, highly olivine-clinopyroxene phyric basaltic clasts. Very highly altered and with vesicles filled by green clay minerals. Petrographically similar to clasts in Units I-1 of Holes SEG75B and SEG75C.

Core Photo

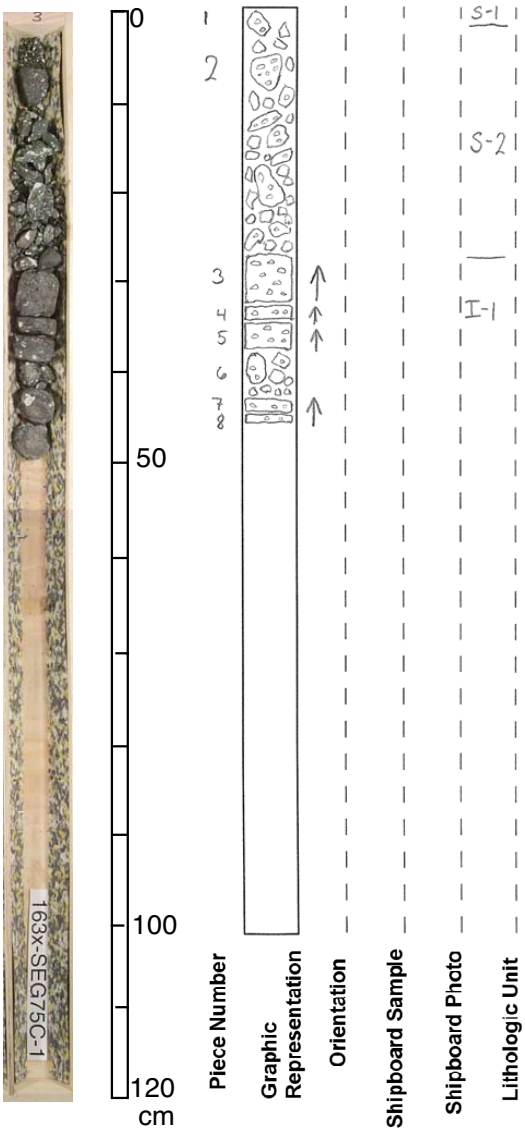
ODP LEG 163X UNIT SUMMARIES **163X-SEG75C-1-1, 3-27**

Transect EG65

Interval 3 - 27 cm **Depth Interval** .03-.27 mbsf

Unit S-2

Rock highly olivine-clinopyroxene phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1-2
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Amygdulas most often lined with a dark green mineral, possibly epidote, and filled with pale green to white clays, carbonate and zeolites. Sizes around 1-4 mm and shaped as irregular round to ellipsoidal vesicles.

Color grey green

Structure

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, highly olivine-clinopyroxene phyric basaltic clasts. Very highly altered and with vesicles filled by green clay minerals. Petrographically similar to clasts in Units S-1 and C-1 of Hole SEG75A.

Core Photo

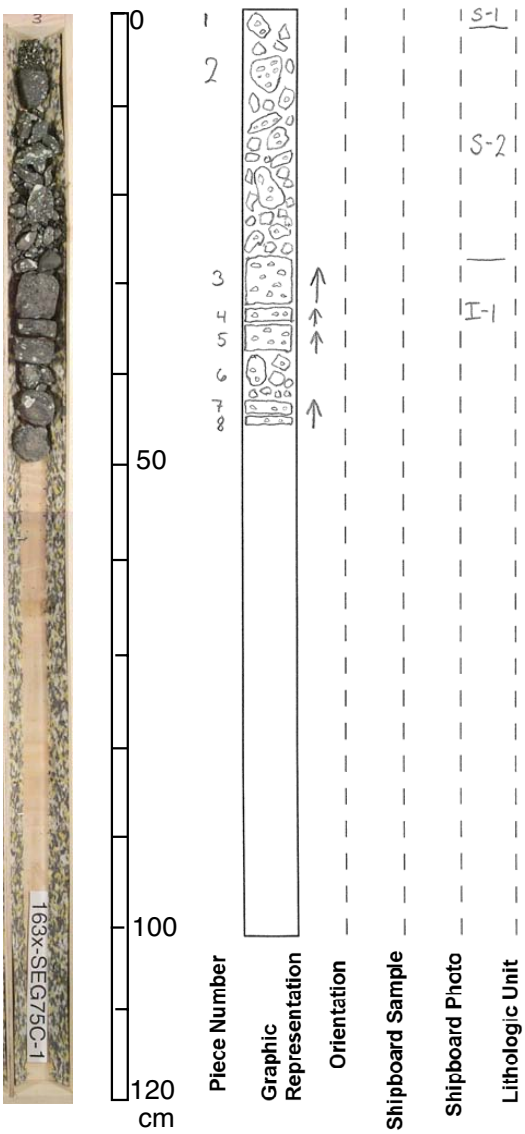
ODP LEG 163X UNIT SUMMARIES **163X-SEG75C-1-1, 27-45**

Transect EG65

Interval 27 - 45 cm **Depth Interval** .27-.45 mbsf

Unit I-1

Rock highly olivine-clinopyroxene phyric basalt



Phenocrysts	Modal %	Size mm
olivine	10	1-2
clinopyroxene	1	1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles Amygdulas most often lined with a dark green mineral, possibly epidote, and filled with pale green to white clays, carbonate and zeolites. Sizes around 1-4 mm and shaped irregularly round to ellipsoidal.

Color grey green

Structure

Alteration very highly (80-95%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, highly olivine-clinopyroxene phyric basalt. Very highly altered and with vesicles filled by green clay minerals. Petrographically similar to clasts in Units S-1 and C-1 of Hole SEG75A.

Core Photo

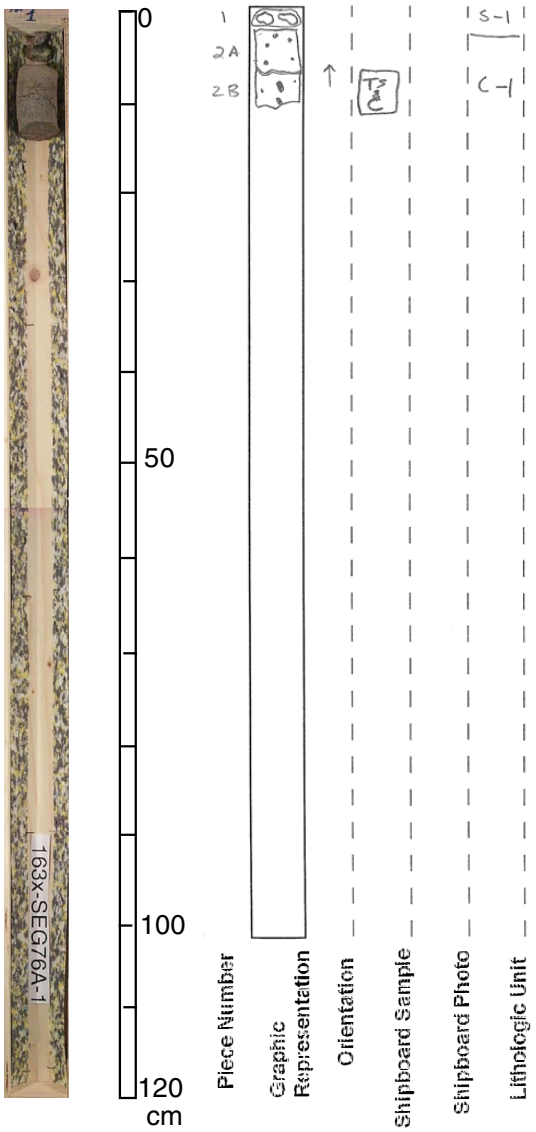
ODP LEG 163X UNIT SUMMARIES **163X-SEG76A-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Singular gneissic clast.

Core Photo

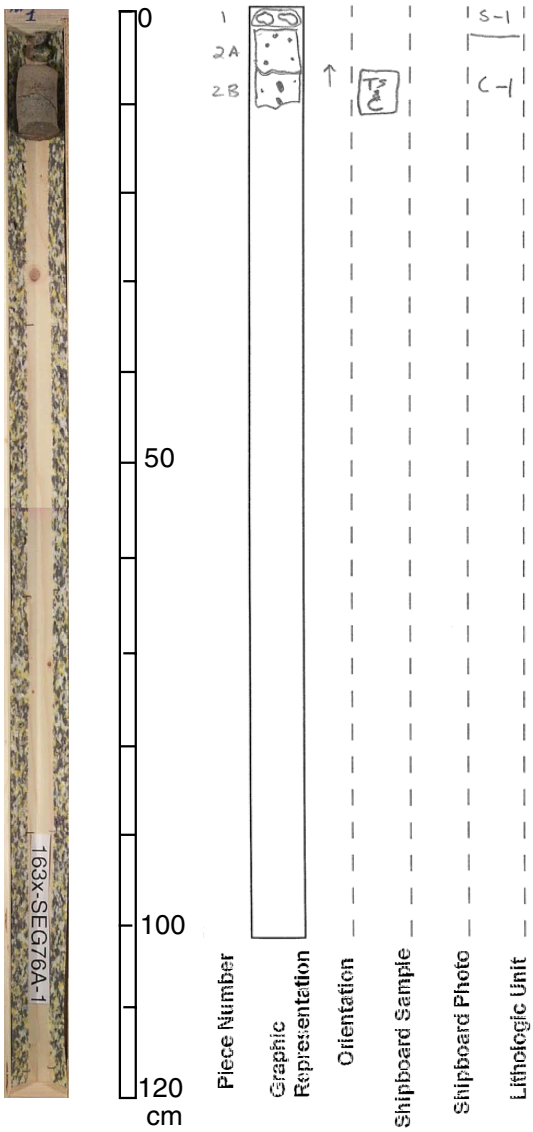
ODP LEG 163X UNIT SUMMARIES **163X-SEG76A-1-1, 3-11**

Transect EG65

Interval 3 - 11 cm **Depth Interval** .03-.11 mbsf

Unit C-1

Rock sparsely olivine-plagioclase phyric basalt



Phenocrysts	Modal %	Size mm
olivine	1	1-2
plagioclase	1	1-2

Phenocrysts	Shape	Alteration %
olivine	prismatic to equant	100
plagioclase	prismatic	100

Groundmass Altered to yellowish brown color; most likely composed of plagioalse and clinopyroxene in a granular fabric.

Vesicles Amygdales are nearly to spherical and filled with a black clay mineral, 0.5-2 mm in diameter

Color brown

Structure massive

Alteration very highly (80-95%)

Vein/fracture fractures filled with yellowish crystalline materiall

Unit Summary

Sparsely olivine-plagioclase phyric basalt. Very highly altered with a a yellowish-brown appearance and amygdaloidal with 0.5-2 mm large, close to spherical amygdules filled with black clay minerals.

Core Photo

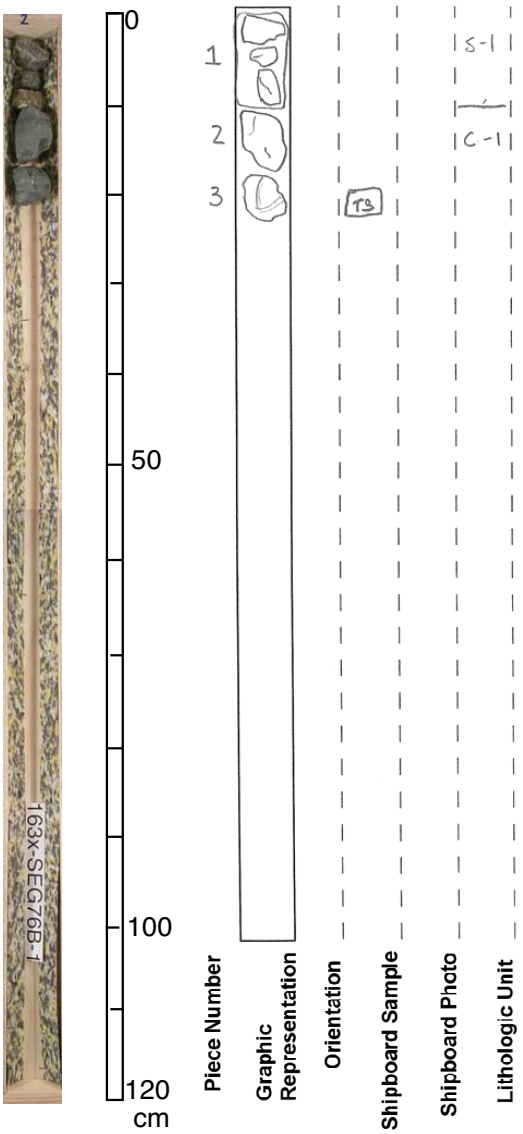
ODP LEG 163X UNIT SUMMARIES **163X-SEG76B-1-1, 0-10**

Transect EG65

Interval 0 - 10 cm **Depth Interval** 0-.1 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Subrounded to subangular clasts of gneiss and sandstone.

Core Photo

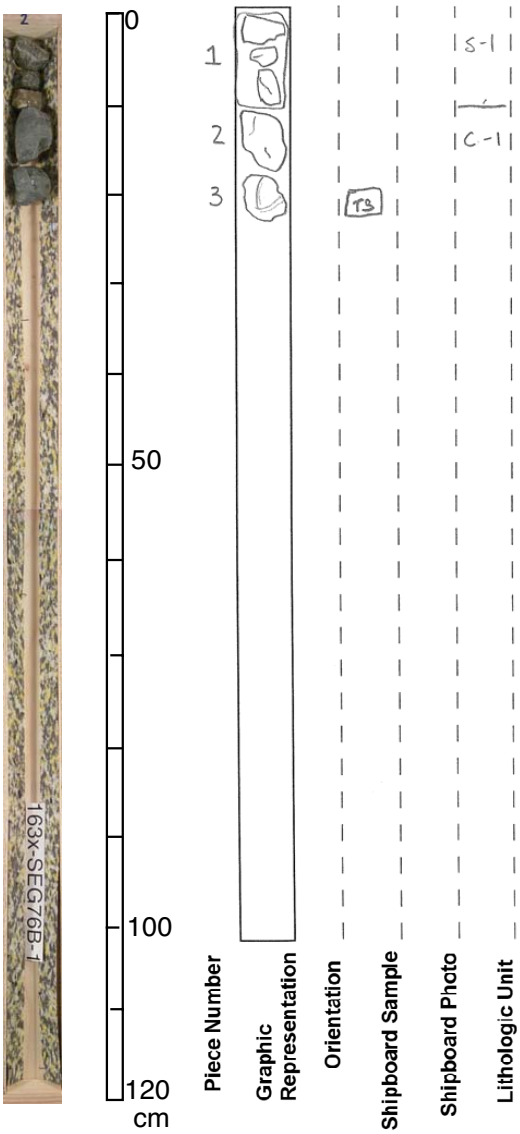
ODP LEG 163X UNIT SUMMARIES **163X-SEG76B-1-1, 10-21**

Transect EG65

Interval 10 - 21 cm **Depth Interval** .1-.21 mbsf

Unit C-1

Rock highly olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	50	1-2

Phenocrysts	Shape	Alteration %
olivine	euhedral	0

Groundmass Intergranular groundmass composed of clinopyroxene and plagioclase.

Vesicles none

Color grey

Structure clast

Alteration fresh (<2%)

Vein/fracture

Unit Summary

Fine-grained, highly olivine phyric basaltic clast with 50 % olivine phenocrysts and very fresh.

Core Photo

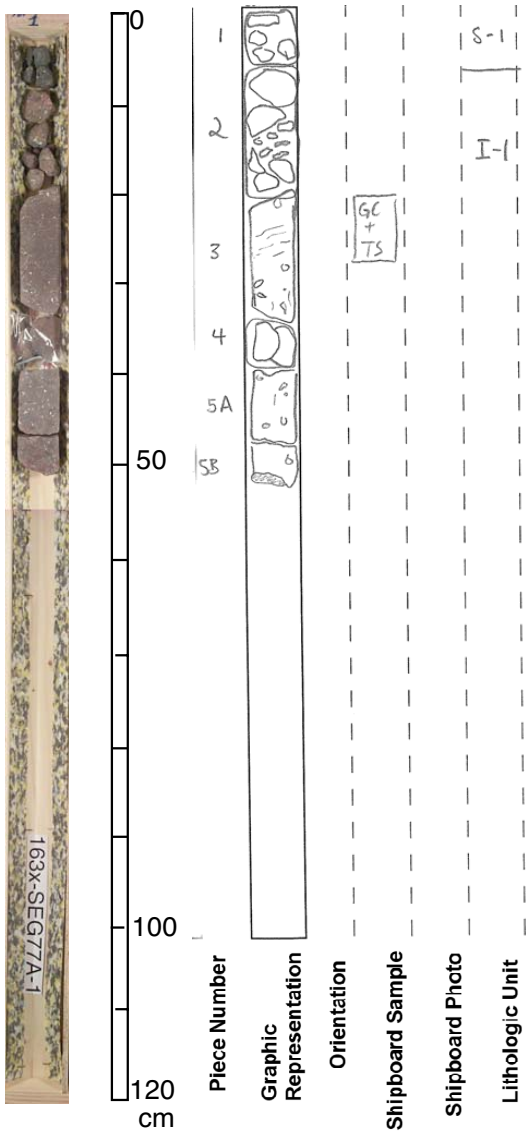
ODP LEG 163X UNIT SUMMARIES **163X-SEG77A-1-1, 0-8**

Transect EG65

Interval 0 - 8 cm **Depth Interval** 0-.08 mbsf

Unit S-1

Rock moderately olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	1-2

Phenocrysts	Shape	Alteration %
olivine	prismatic	20

Groundmass

Vesicles Amygduals filled with green clay mineral.

Color grey

Structure clast

Alteration slightly (2-10%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal, moderately olivine phyric small basaltic clasts.

Core Photo

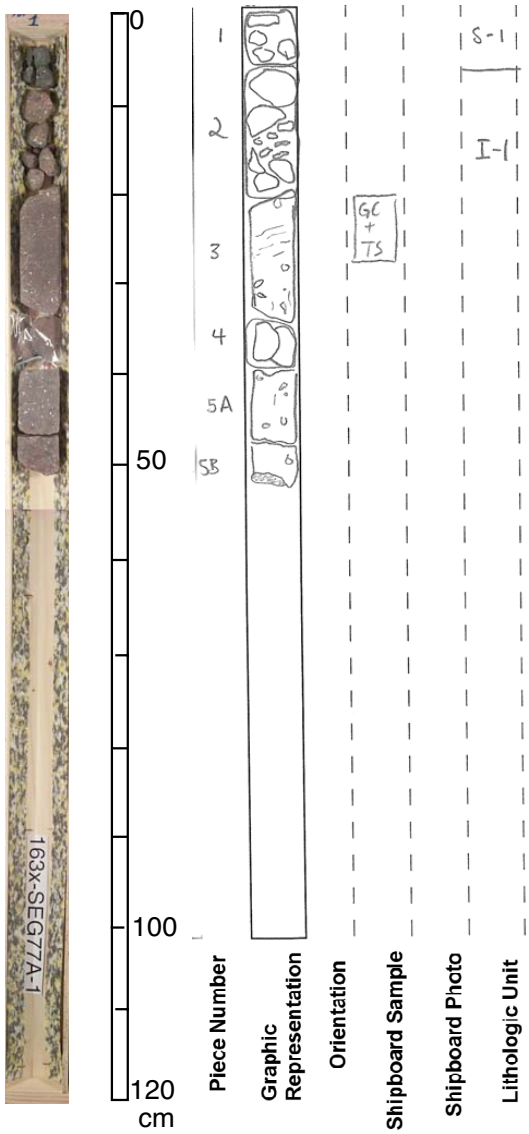
ODP LEG 163X UNIT SUMMARIES **163X-SEG77A-1-1, 8-51**

Transect EG65

Interval 8 - 51 cm **Depth Interval** .08-.51 mbsf

Unit I-1

Rock moderately olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	7	0.5-2

Phenocrysts	Shape	Alteration %
olivine	prismatic to equant	80

Groundmass Groundmass is almost completely altered to a reddish brown color.

Vesicles Vesilces filled with white mineral. Round to very elongate shaped, 0.5-4 mm. In Piece 3 there is a section in which the vesicles may show a flow pattern being elongated in the same direction.

Color brownish red

Structure massive

Alteration highly (40-80%)

Vein/fracture

Unit Summary

Fine-grained, amygdaloidal and vesicular, moderately olivine phyric basalt, highly altered. Vesicles filled with a white mineral, they are round to very elongate shaped, 0.5-4 mm in diameter. Some vesicles are elongated in the same direction reflecting a flow pattern.

Core Photo

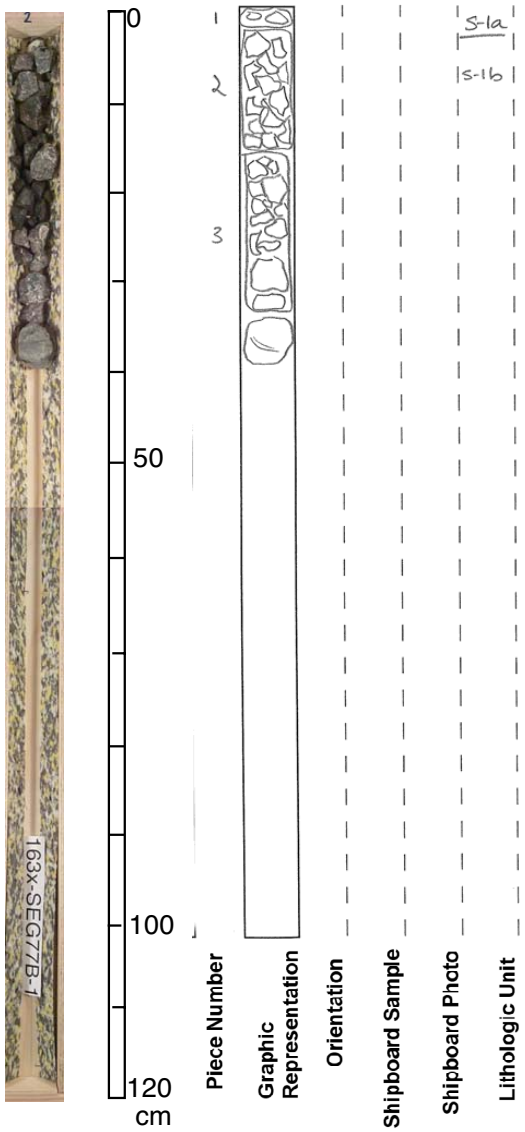
ODP LEG 163X UNIT SUMMARIES **163X-SEG77B-1-1, 0-2**

Transect EG65

Interval 0 - 2 cm **Depth Interval** 0-.02 mbsf

Unit S-1a

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Gneissic clast.

Core Photo

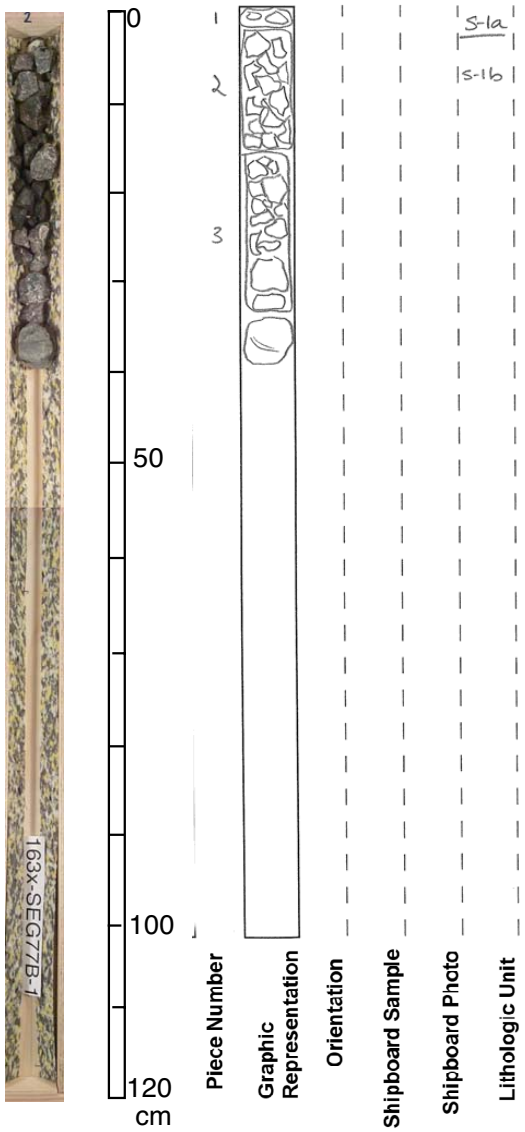
ODP LEG 163X UNIT SUMMARIES **163X-SEG77B-1-1, 2-38**

Transect EG65

Interval 2 - 38 cm **Depth Interval** .02-.38 mbsf

Unit S-1b

Rock moderately olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	0.5-2

Phenocrysts	Shape	Alteration %
olivine	prismatic to equant	85

Groundmass Groundmass almost completely altered to greenish grey material.

Vesicles Vesicles filled with white mineral. Round to very elongate shaped, 0.5-4 mm

Color greyish green

Structure massive

Alteration

Vein/fracture

Unit Summary

Fine-grained, vesicular and amygdaloidal, moderately olivine phyric basaltic clast.

Core Photo

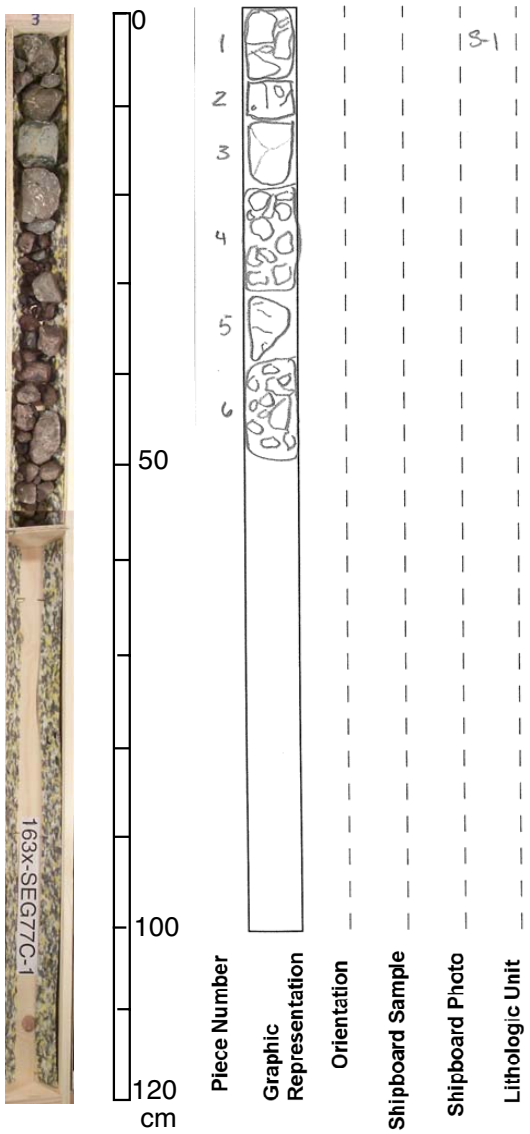
ODP LEG 163X UNIT SUMMARIES **163X-SEG77C-1-1, 0-49**

Transect EG65

Interval 0 - 49 cm **Depth Interval** 0-.49 mbsf

Unit S-1

Rock moderately olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	10	0.5-2

Phenocrysts	Shape	Alteration %
olivine	prismatic to equant	85

Groundmass Groundmass almost completely altered to greenish grey material or red material.

Vesicles Vesicles filled with white mineral. Round to very elongate shaped, 0.5-4 mm

Color greyish green and reddish brown

Structure clast

Alteration

Vein/fracture

Unit Summary

Fine-grained, vesicular and amygdaloidal, moderately olivine phyric basaltic clasts.

SEG78A-1 No recovery

SEG79A-1 No recovery

SEG79B-1 No recovery

Core Photo

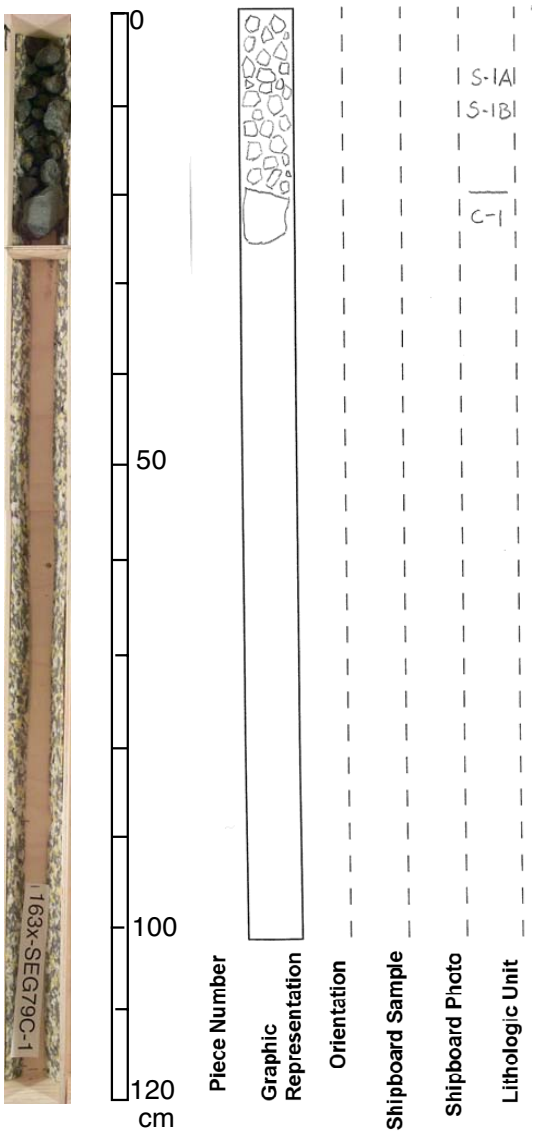
ODP LEG 163X UNIT SUMMARIES **163X-SEG79C-1-1, 0-2**

Transect EG65

Interval 0 - 2 cm **Depth Interval** 0-.02 mbsf

Unit S-1a

Rock aphyric basaltic gravel



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass The groundmass is intergranular and contains plagioclase and clinopyroxene.

Vesicles Spherical to ellipsiodal, around 2 mm large, unfilled

Color red brown

Structure

Alteration highly (40-80%)

Vein/fracture

Unit Summary

Fine-grained, aphyric basaltic clasts.

Core Photo

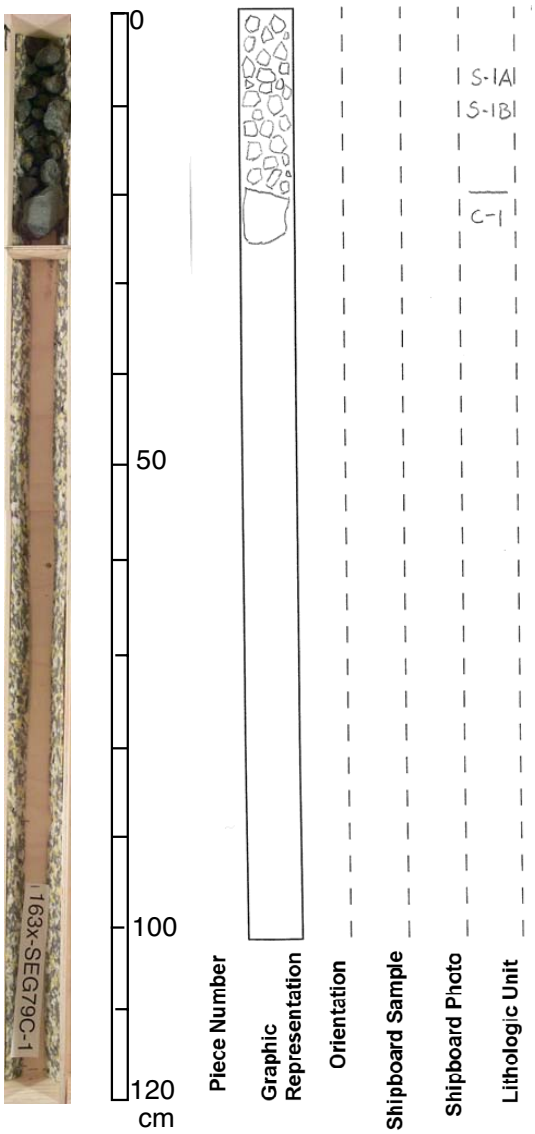
ODP LEG 163X UNIT SUMMARIES **163X-SEG79C-1-1, 2-19**

Transect EG65

Interval 2 - 19 cm **Depth Interval** .02-.19 mbsf

Unit S-1b

Rock highly olivine phyric basaltic gravel



Phenocrysts	Modal %	Size mm
olivine	12	2
clinopyroxene	1 (?)	<1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	

Groundmass Composed of plagioclase and clinopyroxene in an intergranular fabric.

Vesicles

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Subangular, pebble-sized, highly olivine phyric basaltic clasts.

Core Photo

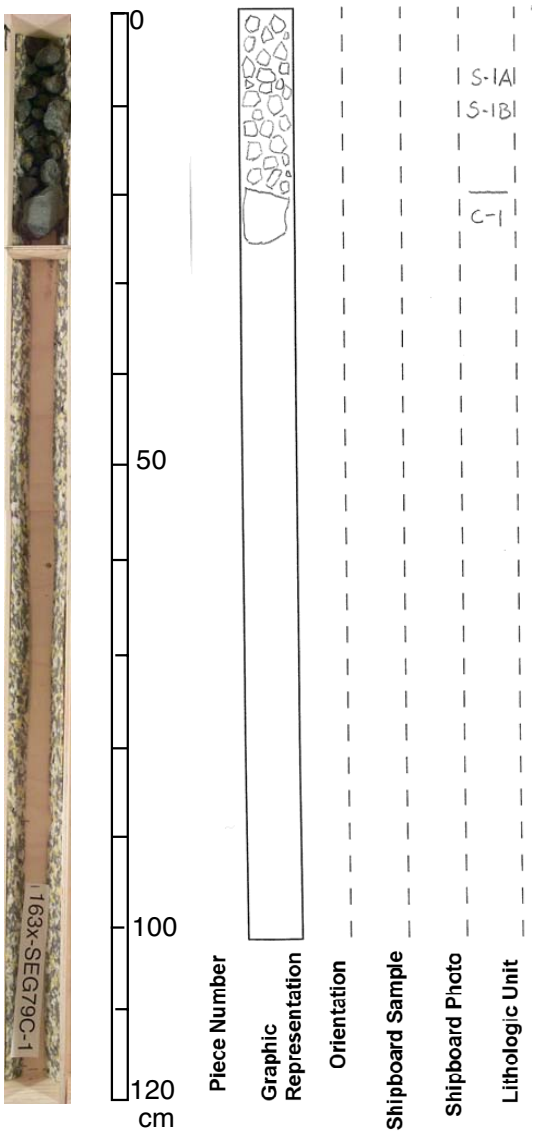
ODP LEG 163X UNIT SUMMARIES **163X-SEG79C-1-1, 19-35**

Transect EG65

Interval 19 - 35 cm **Depth Interval** .19-.35 mbsf

Unit C-1

Rock highly olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	12	2
clinopyroxene	1 (?)	<1

Phenocrysts	Shape	Alteration %
olivine	sub- to euhedral	100
clinopyroxene	subhedral	

Groundmass Intergranular groundmass with clinopyroxene and plagioclase.

Vesicles

Color grey

Structure massive

Alteration moderately (10-40%)

Vein/fracture

Unit Summary

Fine-grained, highly olivine phyric basaltic cored clast with possible glacially polished upper surface. The basalt is moderately altered and massive.

Core Photo

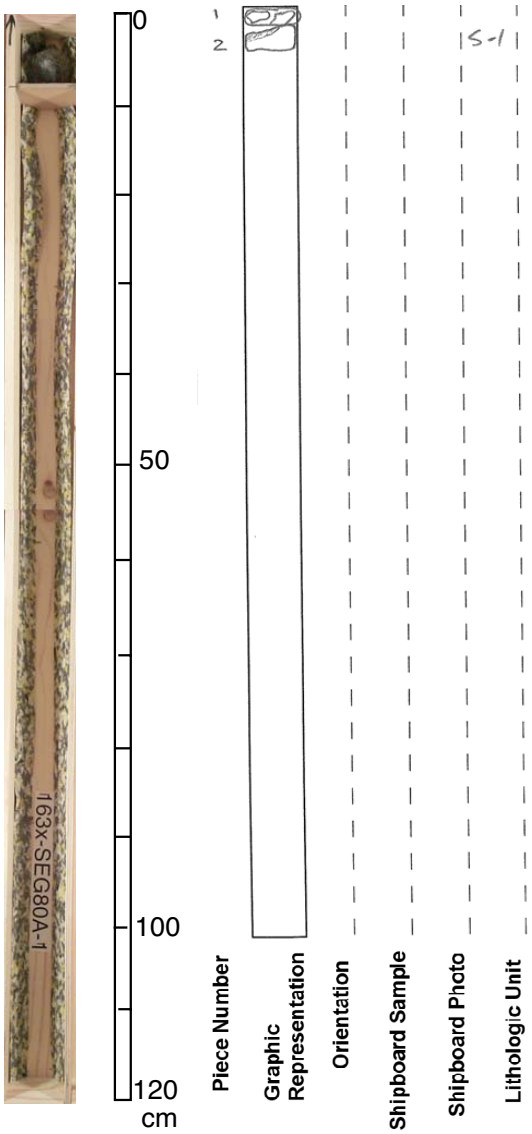
ODP LEG 163X UNIT SUMMARIES **163X-SEG80A-1-1, 0-2**

Transect EG65

Interval 0 - 2 cm **Depth Interval** 0-.02 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure clast

Alteration

Vein/fracture

Unit Summary

Various basaltic clasts.

Core Photo

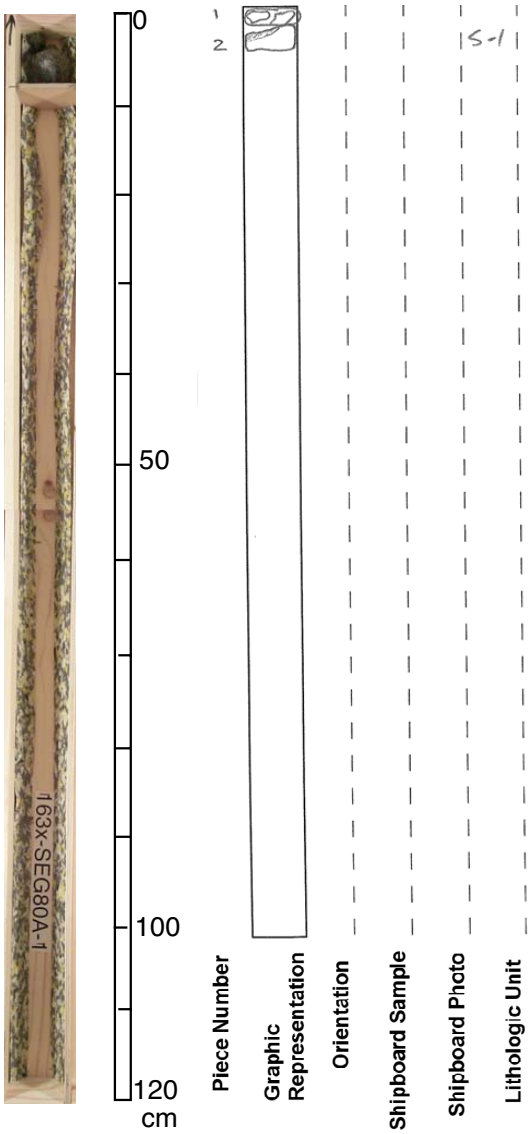
ODP LEG 163X UNIT SUMMARIES **163X-SEG80A-1-1, 2-5**

Transect EG65

Interval 2 - 5 cm **Depth Interval** .02-.05 mbsf

Unit C-1

Rock highly clinopyroxene-plagioclase-olivine phyric basalt



Phenocrysts	Modal %	Size mm
olivine	25	1-3
plagioclase	25	1-3
clinopyroxene	50	1-4

Phenocrysts	Shape	Alteration %
olivine		90
plagioclase		
clinopyroxene		

Groundmass

Vesicles

Color grey green

Structure massive

Alteration moderately (10-40%)

Vein/fracture fracture filled with green mineral

Unit Summary

Cored medium-grained, highly clinopyroxene-plagioclase-olivine phyric basaltic clast.

Core Photo

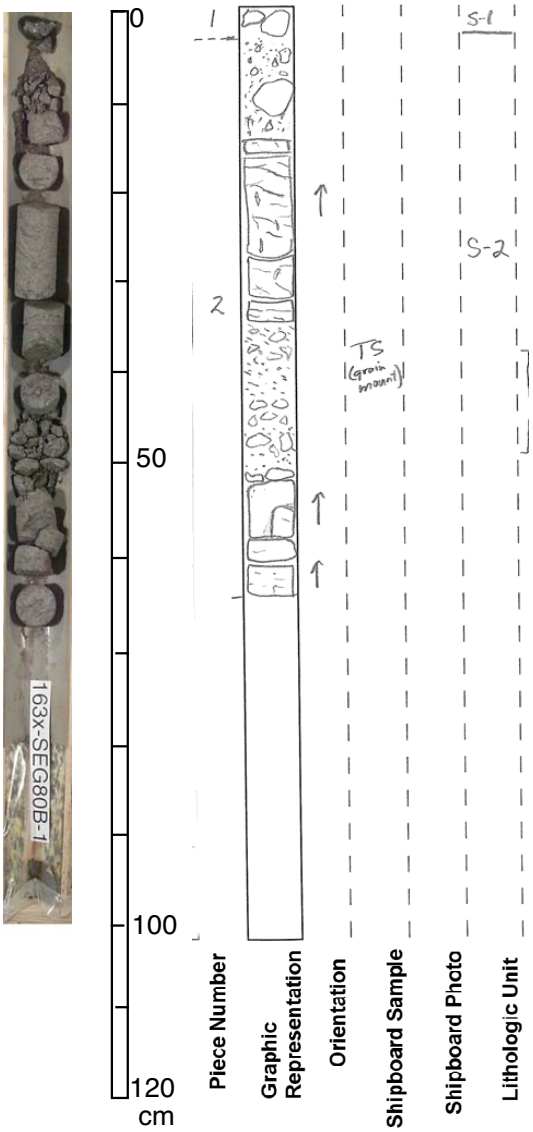
ODP LEG 163X UNIT SUMMARIES **163X-SEG80B-1-1, 0-3**

Transect EG65

Interval 0 - 3 cm **Depth Interval** 0-.03 mbsf

Unit S-1

Rock diamicton clasts



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure clast

Alteration

Vein/fracture

Unit Summary

Coarse-grained basalt and gneiss pebbles.

Core Photo

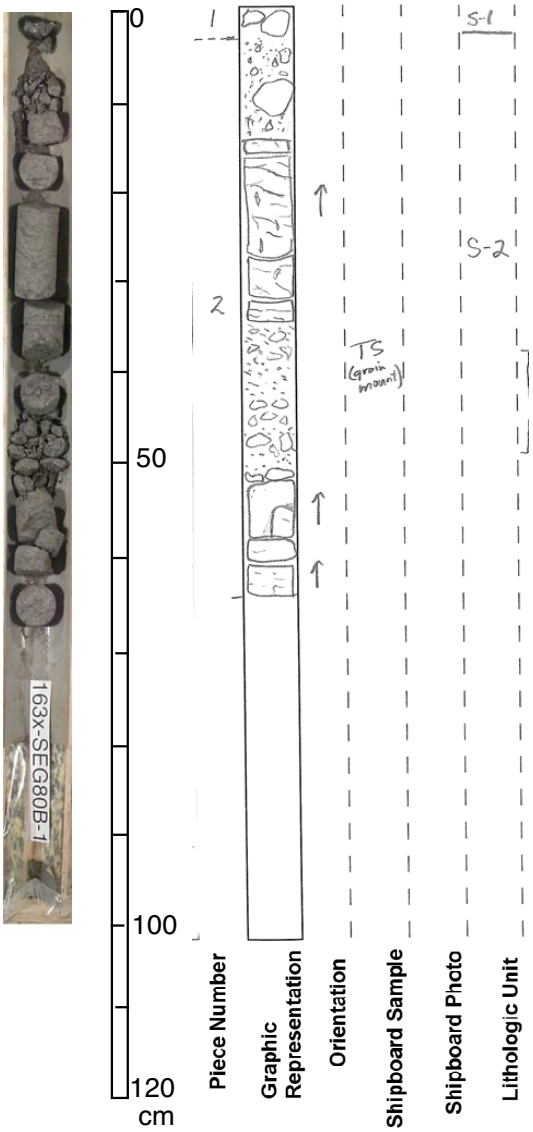
ODP LEG 163X UNIT SUMMARIES **163X-SEG80B-1-1, 3-64**

Transect EG65

Interval 3 - 64 cm **Depth Interval** .03-.64 mbsf

Unit S-2

Rock micaeous sandstone



Phenocrysts **Modal %** **Size mm**

Phenocrysts **Shape** **Alteration %**

Groundmass

Vesicles

Color

Structure

Alteration

Vein/fracture

Unit Summary

Unconsolidated sandstone.

Core Photo

ODP LEG 163X UNIT SUMMARIES **163X-SEG81A-1-1, 0-11**

Transect EG65

Interval 0 - 11 cm **Depth Interval** 0-.11 mbsf

Unit S-1

Rock diamicton clasts

0
50
100
120
cm

Piece Number
Graphic Representation
Orientation
Shipboard Sample
Shipboard Photo
Lithologic Unit

Phenocrysts	Modal %	Size mm

Phenocrysts	Shape	Alteration %

Groundmass

Vesicles

Color

Structure clast

Alteration

Vein/fracture

Unit Summary

Subangular fragments of sandstone and cored clast of foliated gneiss.

SEG81B-1 No recovery

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG21D-1-1, 9-13 cm, Piece 1A

Rock sparsely plagioclase-clinopyroxene-olivine phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	<1	0	0.5	subhedral to anhedral	completely altered
plagioclase	1	1	1.5	subhedral	prismatic; laths
clinopyroxene	<1	<1	0.5	subhedral to anhedral	often twinned; hour-glass

Groundmass	% Original	Comment
plagioclase	58	
clinopyroxene	38	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
unidentified	<1	olivine	yellow brown, not pleochroic
unidentified	15	groundmass, mesostasis	dark brown

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by yellowish brown to dark brown and nearly opaque clays.

Summary

Fine-grained, sparsely plagioclase-clinopyroxene-olivine phyric and glomerophyric basalt. The groundmass is intergranular to intersertal and is composed of plagioclase, augite, oxide minerals, and mesostasis areas. The sample is moderately altered to secondary clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG22A-1-1, 15-19 cm, Piece 3A

Rock moderately plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture trachytic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	5	5	<2	euhedral & subhedral	prismatic; laths
clinopyroxene	<1	<1	<0.5	subhedral	subophitic to prismatic

Groundmass	% Original	Comment
plagioclase	50	
clinopyroxene	30	
mesostasis	10	replaced by dark clays
oxides	5	

Alteration	% Present	Filling/Replacing	Comment
clays	2	plagioclase	
clays	5	mesostasis	replaced by dark clays

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by yellowish brown, dark brown, and nearly opaque clays.

Summary

Fine-grained, moderately plagioclase-clinopyroxene phyric and glomerophyric basalt. The groundmass is intergranular to intersertal, trachytic, and is composed of plagioclase, augite, oxide minerals, and mesostasis areas. The sample is slightly altered to various clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG23A-1-1, 0-4 cm, Piece 1

Rock sparsely plagioclase-olivine phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	trace	<0.5	subhedral-anhedral	almost totally altered
plagioclase	1	1	<1	euhedral & subhedral	
clinopyroxene					

Groundmass	% Original	Comment
olivine	3	
plagioclase	50	
clinopyroxene	38	
mesostasis	5	

Alteration	% Present	Filling/Replacing	Comment
unidentified	4	olivine	brown

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by orange-yellowish brown to nearly opaque clays.

Summary

Fine-grained, sparsely plagioclase-olivine phyric basalt. The groundmass is trachytic, slightly intersertal, and contains less than 3 % olivine together with plagioclase, clinopyroxene, and opaque minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG24A-1-1, 4-8 cm, Piece 2

Rock moderately plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	5	3	<1	euhedral & subhedral	prismatic; laths
clinopyroxene	2	2	<0.5	subhedral	subophitic; prismatic

Groundmass	% Original	Comment
plagioclase	45	
clinopyroxene	38	
mesostasis	3	
oxides	7	

Alteration	% Present	Filling/Replacing	Comment
clays	2	plagioclase phenocrysts	
clays	10	groundmass	

Vesicles and Veins

Vesicls are mostly unfilled, 1-2 mm in diameter, and round. Some vesicles are filled by prismatic zeolite. The groundmass and phenocrysts are partially replaced by reddish to yellowish brown and dark brown clays.

Summary

Fine-grained, vesicular, moderately plagioclase-clinopyroxene phyric and glomerophyric and seriate basalt. The groundmass is intergranular to intersertal and composed of plagioclase, augite, oxide minerals, and mesostasis areas. The sample is slightly altered to various clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG26A-1-1, 85-89 cm, Piece 6G

Rock moderately plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	7	7	2	euhedral & subhedral	slightly altered in places
clinopyroxene	1	1	0.5	euhedral to anhedral	twinned

Groundmass	% Original	Comment
plagioclase	49	
clinopyroxene	40	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
unidentified	1	vesicles	

Vesicles and Veins

Vesicles are unfilled, round and about 1 mm in diameter. A few vesicles are filled with calcite, prismatic zeolite, and a yellowish brown strongly pleochroic mineral with one good cleavage. The groundmass and phenocrysts are partially replaced by greenish brown, orange brown, and dark brown clays.

Summary

Fine-grained, moderately plagioclase-clinopyroxene phyric to glomerophyric basalt. The groundmass is intergranular and moderately intersertal and composed of plagioclase, augite, and oxide minerals. The sample is vesicular, amygdoloidal, and the groundmass is relatively fresh.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG27A-1-1, 47-51 cm, Piece 5A

Rock highly plagioclase-clinopyroxene-olivine phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	4	0	~0.5	euhedral & subhedral	
plagioclase	10	7	1-2	subhedral	lath shaped
clinopyroxene	4	4	0.2-0.5	subhedral	often in glomerocrysts

Groundmass	% Original	Comment
plagioclase	30	
clinopyroxene	35	
mesostasis	5	light brown, altered glass
oxides	2	crystal habit suggests Ti-magnetite

Alteration	% Present	Filling/Replacing	Comment
iddingsite	4	olivine	dusty appearance
sericite	13	plagioclase	

Vesicles and Veins

Altered glass rims around vesicles. Vesicles are irregularly shaped, 1 mm in size, and generally lined with dark brown to nearly opaque clays. The groundmass and phenocrysts are partially filled with yellowish to bluish green and yellowish brown to nearly opaque clays.

Summary

Fine-grained, vesicular, highly plagioclase-clinopyroxene-olivine phyric and glomerophyric basalt. The groundmass is intersertal to intergranular and contains plagioclase, clinopyroxene, oxide minerals, and mesostasis. Secondary replacement of olivine by iddingsite and plagioclase by sericite. The sample is moderately altered.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG28A-1-1, 28-32 cm, Piece 5

Rock highly plagioclase-olivine-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration highly (40-80%)

Texture glomeroporphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	<1	0	<0.3	subhedral	completely altered
plagioclase	15	15	<3	euhedral & subhedral	prismatic, lath shaped
clinopyroxene	<1	<1	<0.2	subhedral	subophitic, prismatic

Groundmass	% Original	Comment
plagioclase	48	
clinopyroxene	35	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
unidentified	<1	olivine	
clays	30	groundmass	

Vesicles and Veins

Rounded to irregular elongated vesicle partially filled by clays and prismatic zeolite. Unfilled fracture. The groundmass and phenocrysts are partially filled by yellowish to bluish green, brownish green, and dark greenish brown clays.

Summary

Fine-grained, amygdaloidal, highly plagioclase-olivine-clinopyroxene phyric and glomerophyric and seriate basalt. The groundmass is intergranular and composed of plagioclase, augite, and oxide minerals. The groundmass is highly altered to various clay and zeolite minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG29A-1-1, 26-30 cm, Piece 4B

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	<1	0	<0.5	subhedral	replaced by clay minerals
plagioclase	3	3	<3	euhedral & subhedral	prismatic; laths
clinopyroxene	trace	trace	<0.5	subhedral	subophitic; prismatic

Groundmass	% Original	Comment
plagioclase	56	
clinopyroxene	35	
mesostasis	3	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
clays	20	groundmass	
clays	1	vesicles	

Vesicles and Veins

Vesicles and amygdules are very irregular shaped. Vesicles are unfilled to filled with prismatic zeolite, clays and calcite. The groundmass and phenocrysts are partially replaced by greenish brown, yellowish green, and dark red to opaque clays.

Summary

Fine-grained, moderately plagioclase-olivine-clinopyroxene phyric and glomerophyric basalt. The groundmass is intergranularly to moderately intersertal and composed of plagioclase, augite, oxide minerals, and mesostasis areas. The sample is vesicular and amygdaloidal and moderately altered to various clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG31A-1-1, 61-65 cm, Piece 1E

Rock highly plagioclase-clinopyroxene-olivine phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	0	0.3-1	subhedral-anhedral	completely altered
plagioclase	10	10	up to 4	euhedral & subhedral	
clinopyroxene	3	3	0.5	euhedral & anhedral	

Groundmass	% Original	Comment
plagioclase	53	
clinopyroxene	30	
oxides	3	

Alteration	% Present	Filling/Replacing	Comment
unidentified	1	vesicles	dark brown, weakly pleochroic
unidentified	15	groundmass	
bowlingite	<<1		

Vesicles and Veins

Vesicles both filled and unfilled, <1 mm in size, and irregularly shaped. Amygdules are filled with yellowish brown to dark brown clays. The groundmass and phenocrysts are partially replaced by greyish green, yellowish brown, dark brown, and nearly opaque clays.

Summary

Fine-grained, highly plagioclase-clinopyroxene-olivine phyric and glomerophyric basalt. The sample is vesicular and amygdaloidal.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG32A-1-1, 21-23 cm, Piece 2B

Rock hornblende-biotite pegmatoid representative

Grain Size coarse-grained

Alteration fresh (<2%)

Texture pegmatitic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	1	1	equant	
mafic mineral	35	35	2-6	tabular	biotite
mafic mineral	35	35	3-6	prismatic	hornblende
quartz	25	25	4-6		

Groundmass	% Original	Comment

Alteration	% Present	Filling/Replacing	Comment

Vesicles and Veins

Summary

Hornblende-biotite pegmatite with prismatic to interstitial opaque minerals (sulfides).

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG36A-1-1, 11-15 cm, Piece 2B

Rock moderately olivine-clinopyroxene-plagioclase phyric olivine-basalt representative

Grain Size fine-grained

Alteration very highly (80-95%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	5	0	<1	subhedral	altered to clay & iddingsite
plagioclase	<1	<1	0.4	subhedral	
clinopyroxene	3	3	0.6	subhedral to anhedral	

Groundmass	% Original	Comment
olivine	15	altered to clay & iddingsite
plagioclase	34	
clinopyroxene	10	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
iddingsite	15	olivine	phenocrysts and in groundmass
clays	35	groundmass	
clays	1	vesicles	

Vesicles and Veins

Vesicles are irregularly shaped, 1-2 mm in size, and filled with orange yellow to brown clays. The groundmass and phenocrysts are partially replaced by orange yellow and orange reddish brown to nearly opaque clays.

Summary

Fine-grained, moderately olivine-clinopyroxene-plagioclase phyric and amygdaloidal basalt.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG38B-1-1, 8-12 cm, Piece 2

Rock quartzite

Grain Size fine-grained

Alteration

Texture

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment

Groundmass	% Original	Comment
quartz	70	
calcite	8	
epidote	1	green; high birefringence
oxides	3	

Alteration	% Present	Filling/Replacing	Comment
cement	17	matrix	cements quartz grains; light brown

Vesicles and Veins

Summary

Quartzite.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG40A-1-2, 10-14 cm, Piece 1

Rock highly olivine-plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	15	0	<8	euhedral	prismatic, skeletal, chains
plagioclase	2	2	<1	euhedral	mostly glomerocrystic
clinopyroxene	tarce	trace	<0.5	subhedral	prismatic
chromite	trace	trace	<0.1	euhedral	included in olivine

Groundmass	% Original	Comment
olivine	3	
plagioclase	50	
clinopyroxene	30	
oxides	1	

Alteration	% Present	Filling/Replacing	Comment
clays	<1	vesicles	
clays	15	olivine	red to orange brown color

Vesicles and Veins

A few vesicles are very irregularly shaped and filled with light yellowish brown clays. The groundmass and phenocrysts are partially replaced by yellowish red, dark red, and yellowish green clays.

Summary

Fine-grained, highly olivine-plagioclase-clinopyroxene phyric basalt. The groundmass is intergranular and composed of plagioclase, clinopyroxene, minor olivine (replaced), and oxide minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG41A-1-1, 16-20 cm, Piece 1C

Rock highly plagioclase-olivine-clinopyroxene phyric olivine-basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	2	0	<1	euhedral & subhedral	equant
plagioclase	8	8	<1	euhedral & subhedral	laths, prismatic
clinopyroxene	trace	trace	<0.5	subhedral	prismatic

Groundmass	% Original	Comment
olivine	5	
plagioclase	54	
clinopyroxene	30	
oxides	1	

Alteration	% Present	Filling/Replacing	Comment
clays	7	olivine	dark brown mixture of clays

Vesicles and Veins

A few unfilled vesicles are generally round, 1-2 mm in diameter, and often with a dark brown lining mineral. Other vesicles are filled by a light yellow brown clay mixture. The groundmass and phenocrysts are partially replaced by very dark brown to nearly opaque clays.

Summary

Fine-grained, plagioclase-olivine-clinopyroxene phyric and glomerophyric olivine-basalt. The groundmass is intergranular and composed of olivine (replaced), plagioclase, clinopyroxene, and oxide minerals. Only a few, mostly unfilled, vesicles.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG42B-1-1, 7-8 cm, Piece 2

Rock highly olivine-plagioclase phyric basalt
representative from freshest portion

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	12	1	0.5-2	equant	also prismatic; highly altered
plagioclase	10	10	0.5-1	tabular	

Groundmass	% Original	Comment
mesostasis	10	
plagioclase	22	
clinopyroxene	40	
oxides	5	

Alteration	% Present	Filling/Replacing	Comment
calcite	1	vesicles	vesicles also filled with clay minerals
unidentified	11	olivine	

Vesicles and Veins

Fracture filled with a greenish (chlorite) clays. Vesicles are irregularly shaped and all vesicles are filled by light yellow brown and green clays. The groundmass and phenocrysts are partially replaced by yellowish red (olivine) and dark reddish brown clays.

Summary

Fine-grained, highly olivine-plagioclase phyric basalt with vesicles filled by carbonate and clay minerals. Fracture filled by chlorite.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG42C-1-1, 41-45 cm, Piece 5

Rock highly plagioclase-olivine-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	6	1	<2	euhedral-anhedral	unaltered olivine in centers
plagioclase	7	7	<2	euhedral & subhedral	
clinopyroxene	3	3	<1	subhedral-anhedral	

Groundmass	% Original	Comment
plagioclase	25	
clinopyroxene	35	
oxides	2	
mesostasis	20	

Alteration	% Present	Filling/Replacing	Comment
calcite	<1	vesicles	
iddingsite	3	olivine	
bowlingite	2	olivine	
zeolite	<1	vesicles	

Vesicles and Veins

Vein filled with green mineral (chlorite?). A few vesicles are filled with light yellowish brown clays and calcite, but most veiscles are unfilled, irregularly shaped, and 1 mm wide. The groundmass and phenocrysts are partially replaced by reddish brown clay mixture.

Summary

Fine-grained, vesicular, highly plagioclase-olivine-clinopyroxene phyric and glomerophyric and seriate basalt.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG43A-1-1, 11-15 cm, Piece 4

Rock highly olivine-plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	10	<1	0.5-2	euhedral & subhedral	
plagioclase	9	9	0.5-1.5	euhedral & subhedral	
clinopyroxene	2	2	<0.5	subhedral	

Groundmass	% Original	Comment
olivine	2	altered to iddingsite
plagioclase	37	
clinopyroxene	25	
oxides	2	

Alteration	% Present	Filling/Replacing	Comment
calcite	2	vesicles	
iddingsite	3	olivine	
unidentified	8	olivine	
zeolite?	10	groundmass/vesicles	light green; spherulitic texture

Vesicles and Veins

A few calcite filled vesicles. The groundmass and phenocrysts are partially replaced by a yellowish white material with reddish brown rims.

Summary

Fine-grained, amygdaloidal, highly olivine-plagioclase-clinopyroxene phyric basalt.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG44A-1-1, 38-42 cm, Piece 1B

Rock sparsely olivine phyric olivine basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture amygdaloidal

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	<1	1	equant	

Groundmass	% Original	Comment
olivine	5	
plagioclase	50	
clinopyroxene	41	
oxides	3	

Alteration	% Present	Filling/Replacing	Comment
clay	1	vesicles	

Vesicles and Veins

Vesicles are sparse and filled with dark brown to nearly opaque clays. They are round to irregularly shaped and approximately 0.5-1 mm in diameter. The groundmass and phenocrysts are partially replaced by yellowish brown to dark yellowish brown clays.

Summary

Fine-grained, sparsely olivine phyric olivine-basalt with amygdules of clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG45A-1-1, 45-49 cm, Piece 6

Rock moderately olivine-clinopyroxene-plagioclase phyric basalt
representative

Grain Size fine-grained

Alteration completely (95-100%)

Texture vesicular

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	4	0	<0.5	euhedral-anhedral	totally replaced
plagioclase	2	2	<0.5	subhedral	
clinopyroxene	4	4	<0.8	euhedral-anhedral	

Groundmass	% Original	Comment

Alteration	% Present	Filling/Replacing	Comment
various	86	groundmass	phases can no longer be recognized
unidentified	<1	rim of vesicles	
iddingite	4	olivine	
clay	3	vesicles	

Vesicles and Veins

The rock is very vesicular with most vesicles emty or partially filled. The vesicles and amygdules are irregularly shaped and approximately 1 mm in diameter. Some vesicles are filled with yellowish brown, reddish brown, dark brown to brown and nearly opaque clays. The same clays partially replace the groundmass and phenocrysts.

Summary

Very fine-grained, moderately olivine-clinopyroxene-plagioclase glomerophyric basalt. Highly vesicular with many vesicles filled by secondary minerals. The groundmass as well as many of the phenocrysts are completely altered.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG47A-1-1, 70-74 cm, Piece 9

Rock sparsely olivine-clinopyroxene phyric basalt representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture amygdaloidal

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	<1	<1	1-2	equant	
clinopyroxene	<1	<1	1-2	prismatic	

Groundmass	% Original	Comment
plagioclase	58	
clinopyroxene	35	
oxides	4	

Alteration	% Present	Filling/Replacing	Comment
zeolite	2	vesicles	

Vesicles and Veins

Vesicles are very circular, 1-4 mm in diameter, and are filled with prismatic zeolites and dark yellowish brown to nearly opaque clay mixtures. The same clays replace the groundmass and phenocrysts.

Summary

Fine-grained, sparsely olivine-clinopyroxene phyric basalt with amygdules filled by prismatic zeolites and dark yellowish brown to nearly opaque clays. The same clays partially replace the groundmass and phenocrysts.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG51C-1-1, 25-29 cm, Piece 6

Rock moderately clinopyroxene-plagioclase phyric basalt representative

Grain Size fine-grained

Alteration very highly (80-95%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	3	3	<1	euhedral	laths
clinopyroxene	5	5	<2	subhedral	prismatic, subophitic

Groundmass	% Original	Comment

Alteration	% Present	Filling/Replacing	Comment
various	92	groundmass	oxidized and altered

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by whitish yellow to reddish brown to opaque clays.

Summary

Fine-grained, moderately clinopyroxene-plagioclase phyric basalt. The groundmass is strongly oxidized and altered.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG52A-1-1, 16-20 cm, Piece 2B

Rock sparsely plagioclase-clinopyroxene phyric basalt representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture glomeroporphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	1	1	1-2	tabular	zoning; glomerocryst
clinopyroxene	<1	<1	1	subhedral	glomerocrysts and singular

Groundmass	% Original	Comment
oxide	10	
plagioclase	50	
clinopyroxene	38	

Alteration	% Present	Filling/Replacing	Comment
clays	1	vesicles	filled with dark clay mineral

Vesicles and Veins

Vesicles are usually irregularly shaped, about 0.5-1 mm in size, and are filled by dark brown to opaque clays.

Summary

Fine-grained, sparsely plagioclase-clinopyroxene phyric and glomerophyric basalt with amygdales of clay minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG54A-1-1, 14-18 cm, Piece 3

Rock moderately clinopyroxene-plagioclase-olivine phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	0	1	euhedral	replaced by opaque matter
plagioclase	2	2	<0.5	euhedral	laths
clinopyroxene	5	5	1	subhedral	prismatic, subophitic

Groundmass	% Original	Comment
plagioclase	56	trachytic
clinopyroxene	26	
oxides	10	

Alteration	% Present	Filling/Replacing	Comment
clays	1	olivine	nearly opaque clays
various	20	groundmass	
clays	<1	vesicles	

Vesicles and Veins

Vesicles and amygdules are about 1 mm in size and generally irregularly shaped. The vesicles filled with dark brown to nearly opaque clays. The groundmass and phenocrysts are partially replaced by the same dark clays.

Summary

Fine-grained, moderately clinopyroxene-plagioclase-olivine basalt. The olivine phenocrysts are replaced. Occasionally vesicles are filled by a nearly opaque material. The clinopyroxene phenocrysts are subophiic to prismatic in shape.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG55B-1-1, 27-31 cm, Piece 4

Rock sparsely plagioclase phyric basalt
representative

Grain Size fine-grained

Alteration moderately (10-40%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	2	2	<2	euhedral & subhedral	

Groundmass	% Original	Comment
plagioclase	48	
clinopyroxene	25	
oxides	1	

Alteration	% Present	Filling/Replacing	Comment
zeolite	1	vesicles	
calcite	1	vesicles	
clay	2	vesicles	
various	20	groundmass	

Vesicles and Veins

Vesicles, mostly <1 mm in size, are either unfilled or filled with prismatic zeolite, calcite, and dark brown to nearly opaque clays. One large >4 mm vesicle is present in the thin section.

Summary

Fine-grained, vesicular and amygdaloidal, sparsely plagioclase phyric basalt. The groundmass is highly altered.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG56A-1-1, 14-18 cm, Piece 4

Rock highly plagioclase-olivine-clinopyroxene phyric olivine basalt representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture glomeroporphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
clinopyroxene	4	3	0.5-1	equant	glomerocrysts and single
plagioclase	6	6	2-3	tabular	glomerocrysts and single
olivine	2	1	0.5-1	equant	

Groundmass	% Original	Comment
olivine	7	
plagioclase	40	trachytic texture
clinopyroxene	33	
oxides	5	

Alteration	% Present	Filling/Replacing	Comment
chabazite, clays	1	vesicles	

Vesicles and Veins

Vesicles are round and about 2 mm in diameter and are filled with greenish dark brown to dark brown clays and prismatic zeolite (chabazite).

Summary

Fine-grained, plagioclase-olivine-clinopyroxene phyric and glomerophyric olivine-basalt with trachytic alignment of plagioclase laths in the groundmass. Vesicles filled by dark brown clays.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG57A-1-1, 18-22 cm, Piece 5

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	2	1	0.5-1	equant	
plagioclase	2	2	1	tabular	
clinopyroxene	1	<1	0.5-1	subhedral	

Groundmass	% Original	Comment
mesostasis	10	
plagioclase	46	
clinopyroxene	35	

Alteration	% Present	Filling/Replacing	Comment

Vesicles and Veins

Prismatic zeolite occurs as vesicle filling. The groundmass and phenocrysts are partially filled by dark brown clays.

Summary

Fine-grained, moderately plagioclase-olivine-clinopyroxene phyric basalt with trachytic and intersertal groundmass.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG58A-1-1, 9-13 cm, Piece 1C

Rock highly plagioclase-olivine-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration fresh (<2%)

Texture glomeroporphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	4	3	1-2	subhedral	glomerocrysts and singles
plagioclase	8	8	1-8	tabular	glomerocrysts and singles
clinopyroxene	2	2	1-3	subhedral	glomerocrysts and singles

Groundmass	% Original	Comment
mesostasis	5	
plagioclase	40	
clinopyroxene	32	
oxides	10	

Alteration	% Present	Filling/Replacing	Comment

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by yellowish brown, reddish brown, and dark brown to nearly opaque clays.

Summary

Fine-grained, plagioclase-olivine-clinopyroxene phyric and glomerophyric and seriate basalt. The groundmass is moderately insertal to intergranular.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG60B-1-1, 93-97 cm, Piece 6A

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture amygdaloidal

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	4	0	1	equant; prismatic	completely altered
plagioclase	5	5	1-2	prismatic; tabular	glomerocrysts and singles
clinopyroxene	1	1	0.5-1	subhedral	glomerocrysts and singles

Groundmass	% Original	Comment
plagioclase	50	
clinopyroxene	32	
mesostasis	4	

Alteration	% Present	Filling/Replacing	Comment
clays, zeolite	3	vesicles	

Vesicles and Veins

Vesicles are about 1-4 mm in size and generally elongate shaped. They are filled with platy zeolite as well as with reddish brown, yellowish brown, and dark brown to nearly opaque clays.

Summary

Fine-grained, moderately plagioclase-olivine-clinopyroxene phyric and glomerophyric basalt with vesicles filled by clay and zeolite minerals. The groundmass is slightly intersertal.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG61B-1-1, 19-23 cm, Piece 1B

Rock moderately plagioclase-clinopyroxene phyric basalt
mottled upper part of flow

Grain Size fine-grained

Alteration slightly (2-10%)

Texture trachytic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	5	5	1-2	tabular	
clinopyroxene	1	1	1	subhedral	

Groundmass	% Original	Comment
olivine	2	
plagioclase	50	trachytic texture
clinopyroxene	31	
mesostasis	2	

Alteration	% Present	Filling/Replacing	Comment
clays, zeolite	1	vesicles	

Vesicles and Veins

Spherulititc textures within some of the amygduales. Amygdales are generally round and about 1 mm in diameter. The clays replacing the groundmass and phenocrysts are greenish brown to yellowish brown.

Summary

Fine-grained, amygdaloidal, moderately plagioclase-clinopyroxene phyric basalt. The groundmass is trachytic and slightly intersertal and contains small amounts of olivine.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG61B-1-1, 95-99 cm, Piece 8

Rock moderately plagioclase-clinopyroxene-olivine phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	<1	1	equant	
plagioclase	5	5	2-5	tabular	
clinopyroxene	2	2	1	subhedral to tabular	

Groundmass	% Original	Comment
plagioclase	45	trachytic texture
clinopyroxene	35	
mesostasis	4	
oxides	10	

Alteration	% Present	Filling/Replacing	Comment

Vesicles and Veins

The groundmass and phenocrysts are partially replaced by greenish to yellowish brown clays.

Summary

Fine-grained, moderately plagioclase-clinopyroxene-olivine phyric basalt. The groundmass is trachytic and slightly intersertal.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG62A-1-1, 13-17 cm, Piece 2

Rock moderately plagioclase-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
plagioclase	5	5	1-4	euhedral & subhedral	laths
clinopyroxene	2	2	<0.7	euhedral-anhedral	

Groundmass	% Original	Comment
plagioclase	50	
clinopyroxene	27	
oxide	3	
mesostasis	4	

Alteration	% Present	Filling/Replacing	Comment
clays	1	vesicles	
clays	8	groundmass	

Vesicles and Veins

Vesicles are irregularly shaped, about 1 mm in size, and some are filled by platy zeolite. The groundmass and phenocrysts are partially filled by yellowish to dark brown clays.

Summary

Fine-grained, amygdaloidal, moderately plagioclase-clinopyroxene phyric basalt.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG63A-1-1, 18-20 cm, Piece 3

Rock moderately plagioclase-olivine-clinopyroxene phyric basalt
representative

Grain Size fine-grained

Alteration slightly (2-10%)

Texture glomeroporphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	1	0	<1	subhedral-anhedral	
plagioclase	2	2	<0.8	euhedral & subhedral	
clinopyroxene	1	1	<1	subhedral-anhedral	

Groundmass	% Original	Comment
olivine	4	
plagioclase	55	
clinopyroxene	20	
oxides	5	

Alteration	% Present	Filling/Replacing	Comment
iddingsite	3	olivine	
clays	3	olivine and vesicles	
bowlingite	1	olivine	

Vesicles and Veins

Two parallel unfilled fractures. Most vesicles are filled with dark yellowish brown to nearly opaque clays. They tend to be irregularly shaped and 0.5-1 mm in size. The groundmass and phenocrysts are partially filled by yellowish brown, reddish brown, and yellow clays.

Summary

Fine-grained, vesicular and amygdaloidal, moderately plagioclase-olivine-clinopyroxene glomerophyric basalt. The groundmass is moderately intersertal and contains small amounts of olivine in addition to plagioclase, augite, and opaque minerals.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG76A-1-1, 8-10 cm, Piece 2B

Rock aphyric basalt
representative

Grain Size fine-grained

Alteration completely (95-100%)

Texture amygdaloidal

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	trace	0	1.5	euhedral	one grain
clinopyroxene	trace	trace	1	subhedral	few radiating grains
plagioclase	trace	trace	2		one grain

Groundmass	% Original	Comment
olivine	5	
plagioclase		
clinopyroxene		
oxides	10	

Alteration	% Present	Filling/Replacing	Comment
various	80	groiundmass	
clays	trace	olivine	dark orange red color
clays	9	vesicles	

Vesicles and Veins

Highly vesicular with vesicles, <1 mm in size, filled by a light yellowish to reddish brown clays. Near perfect circular to composite vesicle shapes, but with some irregular shapes.

Summary

Fine-grained, amygdaloidal, aphyric basalt. The amygdales are all filled by a orange-red clay mixture. The groundmass contains olivine, but is completely replaced. Contains only one olivine phenocryst.

ODP LEG 163X THIN SECTION DESCRIPTIONS `TS` 163X-SEG77A-1-1, 22-26 cm, Piece 3

Rock moderately olivine phyric basalt
representative

Grain Size fine-grained

Alteration completely (95-100%)

Texture porphyritic

Phenocryst	% Original	% Present	Size (mm)	Morphology	Comment
olivine	4	0	2	euhedral	skeletal; completely replaced
chromite	trace	trace	0.05	euhedral	

Groundmass	% Original	Comment

Alteration	% Present	Filling/Replacing	Comment
unidentified	4	olivine	
clays	9	groundmass	
clays	4	vesicles	

Vesicles and Veins

Vesicles are filled with whitish yellow to dark brown and opaque clays. Very irregularly shaped and highly altered.

Summary

Fine-grained, amygdaloidal, moderately olivine phyric basalt. Extensive alteration and leaching of phenocrysts, vesicle fillings, and groundmass.