148-896A-1R-1 (Piece 3, 7–14 cm) OBSERVER: IMS WHERE SAMPLED: Unit 1
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to microcrystalline.
TEXTURE: Glomerophyric; radiate-variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.8	0.2–0.45		Euhedral, equant.	
Plagioclase	3.8	3.8	0.2–1.6		Euhedral-anhedral, equant to lath shaped.	
Spinel	Tr	Tr	0.01–0.04		Euhedral, equant.	
GROUNDMASS						
Unspecified	95.4	95.4				Variolitic, defined by spherulitic growth, round swallowtail plagioclase, quench crystals. The spherulitic texture in the variolitic zone grades into plumose texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clay	0.8	Olivine.	Light-green to colorless, in subvariolitic pillow rim and a 0.02-mm vein.
Fe(OH) minerals.	Tr	Opaque minerals.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Vein is 0.02-mm wide and composed of green nontronite. Groundmass is partly altered to brown clay (palagonite?). Black opaque mineral microcrysts have developed along spherulite margins.

148-896A-1R-1 (Piece 4, 14–21 cm) OBSERVER: IMS WHERE SAMPLED: Unit 2
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Seriate porphyritic; intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.8	0.2–1.1		Equant.	
Plagioclase	5.8	5.8	0.2–2.5		Euhedral-anhedral, equant to plates or laths.	
Spinel	Tr	Tr	0.03–0.15		Euhedral-subhedral, equant.	
GROUNDMASS						
Unspecified	92.4	92.4				Quench plagioclase (swallowtail) common, varying in length from 0.05–1.2 mm. Olivine and clinopyroxene are other groundmass phases. Sheaf-spherical and branching textures are common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2	Olivine and interstitial material.	Green or brown color. With calcite after olivine. With iddingsite in brown oxidized alteration band.
Carbonate	Tr	Olivine.	Partially filling pseudomorph after olivine. Has an outer rim of smectite.
Fe(OH) minerals.	Tr	Groundmass.	Disseminated in brown oxidized band.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Two 1–1.5-mm-wide brown oxidized bands cut across the section and a lighter brown zone cuts one edge of the section. "Iddingsite" is concentrated in the three brown zones but is also present in lesser amounts throughout the section.

148-896A-1R-1 (Piece 11, 47–55 cm) OBSERVER: IMS WHERE SAMPLED: Unit 3
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to microcrystalline.
TEXTURE: Glomerophyric to porphyritic; radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.6	0.1–0.35		Euhedral, equant.	
Plagioclase	5.6	5.6	0.34–2.6		Euhderal-anhedral, equant to laths.	
Spinel	Tr	Tr	0.02–0.17		Euhedral-anhedral, equant.	
GROUNDMASS						
Unspecified	93.6	93.6				Fan-shaped quench crystals common. Comb texture defined by plagioclase and clinopyroxene intergrowth is also common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	0.6	Olivine and plagioclase.	Pale brown (saponite?) that partly replaces plagioclase where cut by veinlets.
Carbonate	Tr	Vein.	Blocky crystals.
Fe(OH) minerals	Tr		

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section is cut by three 1- to 3-mm-wide veins with 2- to 3-mm-wide oxidation halos. Veins are composed of an outer zone of smectite and an inner zone of calcite (mostly plucked out). The section is also cut by several 0.08-mm-wide pale brown (saponite?) veinlets. Fibers in these veins are perpendicular to the vein walls. Brown Fe-oxyhydroxide staining and replacement of plumose clinopyroxene was recorded.

148-896A-2R-1 (Piece 2, 5–12 cm) OBSERVER: IMS WHERE SAMPLED: Unit 4
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.4	0.1–0.4		Euhedral, equant.	
Plagioclase	5	5	0.3–2.4		Euhedral-subhedral, equant.	
Spinel	Tr	Tr	0.02–0.1		Euhedral-subhedral, equant.	
GROUNDMASS						
Unspecified	93.6	93.6				Branching quench crystals of plagioclase and olivine fill intersticies between larger, 0.04–1 mm plagioclase crystals. Comb texture is common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.4	Olivine and interstitial material.	With iddingsite after olivine. Variously colored, colorless to green to yellow to brown, and colloform when after interstitial material, or space. Minor replacement of plagioclase on cracks.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Brown Fe-oxyhydroxide staining, or replacement of plumose clinopyroxene. Very rare olivine cores still present.

148-896A-2R-1 (Piece 10, 41–50 cm) OBSERVER: IMS WHERE SAMPLED: Unit 7
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to glassy.
TEXTURE: Glomerophyric-porphyritic; radiate (variolitic).

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.6	0.05–1.0		Euhedral, equant.	
Plagioclase	4	4	0.2–3.5		Euhedral-subhedral, laths and needles.	
Spinel	Tr	Tr	0.02–0.08		Euhedral-subhedral, equant.	
GROUNDMAS						
Unspecified	94.4	94.4				Gradational change from pure glass to variolitic zone, and further into a honeycomb texture. Plagioclase typically shows a swallow-tail morphology.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.6	Olivine.	Pale brown saponite(?) completely replaces olivine.
Palagonite	Tr	Glass.	Pale green or yellowish green.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section is cut by a 0.05-mm-wide fracture filled by smectite.

148-896A-2R-1 (Piece 19, 82–90 cm) OBSERVER: IMS WHERE SAMPLED: Unit 7
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric; radiate, intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	1.8		0.1–1.2		Euhedral, equant.	
Plagioclase	3.2		1.28–0.2		Euhedral to subhedral.	
Spinel	Tr	Tr	0.4–0.8		Equant, euhedral to subhedral.	
GROUNDMASS						
Plagioclase	34.8					
Olivine	21.7					Olivine and clinopyroxene show skeletal, feathery, and branching granular textures. Comb textures are also common, and are defined by intergrowths of plagioclase, olivine, and clinopyroxene.
Clinopyroxene	34.2					
Magnetite	1.3	?				

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2	Olivine, interstitial.	Colorless smectite and "iddingsite." In glass or voids, colloform green, yellow at center, or zoned orange to reddish brown.
Iron hydroxide	Tr	Vein.	Dark brown to orange, 0.02 mm wide.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The entire section is oxidized, but the intensity varies across the slide. Fine-grained magnetite is associated with red FeOOH around pores and phenocrysts that are filled with green clay (0.8 mm).

148-896A-2R-1 (Piece 21, 94–101 cm) OBSERVER: IMS WHERE SAMPLED: Unit 7
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.6	0.2–0.8		Euhedral, equant.	
Plagioclase	6.8	6.8	0.2–3.1		Euhedral to subhedral, equant to plates.	
Spinel	Tr	Tr	0.03–0.12		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	90.6	90.6				Plagioclase needles range in size from 0.05–1.5 mm. Plagioclase, olivine, and clinopyroxene fan and spherical quench structures have nucleated on these plagioclase needles. Comb texture is common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.6	Olivine and interstitial material.	Colorless to brown when replacing olivine. Colloform, beige to green or colorless to tan when replacing interstitial material (glass or voids?). Also rarely light green clay in plagioclase.
Carbonate	Tr	Interstitial material and vugs.	
Palagonite	Tr	Glass.	Replacement of glass inclusions in plagioclase phenocrysts.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: When clay replaces interstitial material cores are tan to brown and rims are green. Green clays are restricted to one area of the section only.

148-896A-3R-1 (Piece 7, 41–44 cm) OBSERVER: IMS WHERE SAMPLED: Unit 8
ROCK NAME: Moderately phyric plagioclase basalt.
GRAIN SIZE: Cryptocrystalline-microcrystalline.
TEXTURE: Glomerophyric-porphyritic; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.2	0.2–0.5		Euhedral, equant.	
Plagioclase	2.2	2.2	0.1–1.5		Euhedral, equant to lath shaped.	
Spinel	Tr	Tr	0.02–0.09		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	97.6	97.6				Swallowtail plagioclase, 0.05–1.0 mm with quench plagioclase, olivine, and clinopyroxene forming branching and spherulitic textures. Titanomagnetite, 0.001–0.005 mm diameter are also present.

SECONDARY MINERALOGY	PERCENT	REPLACING FILLING	COMMENTS
Clays	Tr	Olivine and groundmass.	Green-brown when after groundmass; tan to yellowish-tan fibers after clay.
Fe(OH) minerals	Tr	Groundmass.	In brown alteration halos adjacent to veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section is cut by a 0.3-mm-wide vein composed of early nontronite (green) with later saponite (pale yellow to bright yellow) + phillipsite + saponite (green) + aragonite. Saponite veins approximately (0.1 mm wide) were also recorded.

148-896A-3R-1 (Piece 9A, 83–86 cm) OBSERVER: IMS WHERE SAMPLED: Unit 9
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.0	0.2–0.8		Euhedral, equant.	
Plagioclase	4.2	4.2	0.2–2.0		Euhedral to subhedral, equant to plate shaped.	
Spinel	Tr	Tr	0.03–0.15		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	94.8	94.8				Plagioclase ranges in size from 0.01–1.0 mm. Sheaf, branch, and comb textures defined by plagioclase, olivine, and clinopyroxene intergrowth.

SECONDARY MINERALOGY	PERCENT	REPLACING FILLING	COMMENTS
Clays	1.0	Olivine and interstitial material.	Olivine replaced by colorless saponite at core and saponite + aragonite + Fe-oxyhydroxide minerals at the rim.
Carbonate	Tr	Olivine.	Aragonite.
Fe(OH) minerals	Tr	Olivine, interstitial material.	Rims of olivine. Staining "plumose" clinopyroxene in groundmass.
Iddingsite	Tr	Olivine.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Majority of thin section is of a brown oxidized alteration zone. Section is cut by a 0.15-mm-wide Fe-oxyhydroxide mineral vein, with minor local aragonite at its core, which is cut and locally reopened by a 0.25-mm-wide aragonite vein. Several thin, <0.02-mm-wide, Fe-oxyhydroxide mineral veins were also recorded.

148-896A-3R-1 (Piece 17, 143–146 cm) OBSERVER: IMS WHERE SAMPLED: Unit 9.
ROCK NAME: Moderately phyric olivine-plagioclase basalt.
GRAIN SIZE: Cryptocrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	1	1.6	0.2–1.0		Euhedral to subhedral, equant.	
Plagioclase	2.4	2.4	0.2–2.0		Euhedral to anhedral, equant to tabular.	Fresh glass inclusions in some grains.
Spinel	Tr	Tr	0.04–0.1		Euhedral-subhedral, equant.	
GROUNDMASS						
Unspecified	94.6	94.6				Sheaf-spherical, branching, plumose, and comb textures defined by intergrown plagioclase, olivine, and clinopyroxene. Plagioclase crystals range from 0.02–1.0 mm long.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2	Olivine and plagioclase.	Tan saponite after olivine. Saponite in cracks in plagioclase.
Smectite	Tr	Interstitial material.	Voids or glass? Green to yellowish brown color.
Carbonate	Tr	Olivine.	
Iddingsite	Tr	Olivine and groundmass.	In cracks and rims of olivine. In red oxidized band.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section is cut by 0.1- to 0.8-mm-wide veins composed of iddingsite, followed by smectite and aragonite. Minor pyrite occurs both in aragonite and clay. Red oxidized band cuts across a relict olivine in a glomerophyric aggregate. Oxidized zone is defined by iddingsite staining and replacement of interstitial material.

148-896A-4R-1 (Piece 1, 5–8 cm) OBSERVER: IMS WHERE SAMPLED: Unit 9
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.2	0.1–0.5		Euhedral, equant.	
Plagioclase	5.6		0.15–1.2		Euhedral, equant-laths.	
Spinel	Tr	Tr	0.03–0.14		Euhedral-anhedral, equant.	
GROUNDMASS						
Magnetite					Equant.	
Unspecified	92.2					Swallowtail plagioclase (0.02–1.1 mm). Intergrown plagioclase and olivine defines sheaf-spherical and branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.2	Olivine, Interstitial voids.	Pale brown smectite replaces olivine and fills in void spaces. Glass inclusions in plagioclase also replaced. Partial replacement of plagioclase.
Aragonite		Veins.	Fibrous, prismatic.
Iddingsite	Tr	Veins and interstitial material.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE
Vesicles					

COMMENTS: The section is crosscut by vein filled by saponite at margins and fibrous prismatic aragonite at core and contains 0.002-mm-wide brown iddingsite + green clay vein. Subtle alignment of groundmass plagioclase grains that have partially altered to pale buff colored clays into 1-mm-wide trails is observed.

148-896A-4R-1 (Piece 9C, 75–80 cm) OBSERVER: IMS WHERE SAMPLED: Unit 9
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Glassy to cryptocrystalline.
TEXTURE: Porphyritic, variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.3	0.8	0.2–1.0		Euhedral, equant.	
Plagioclase	2.2		0.5–2.0		Euhedral to anhedral, equant to tabular.	
Spinel	Tr	Tr	0.02–0.06 mm		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	97					Typical variolitic development from the dendritic overgrowth on plagioclase crystals in the glass zone to spherical bodies that coalesce and further develop into a honeycomb texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Saponite	0.5	Olivine.	Olivine partially replaced in the variolitic area and completely replaced on the glassy rim.
Smectite		Veins, glass.	Yellow-green. In veins and replacing glass on margins of veins.
Zeolite	Tr	Vein	Associated with clay minerals.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE
Vesicles					

COMMENTS: Pillow rim contains fresh glass. Vein (<0.03 mm wide) is filled by fibrous light green to tan clays. Yellow clay rims varioles and phenocrysts in the glass. 1-mm-vein, mostly plucked, contains clay and zeolite (phillipsite?).

148-896A-5R-1 (Piece 9A, 49–52 cm) OBSERVER: IMS WHERE SAMPLED: Unit 10
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline-fine-grained.
TEXTURE: Porphyritic-glomerophyric/radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.6	0.1–0.2		Euhedral, equant.	
Plagioclase	5.2	5.2	1–2		Euhedral to anhedral, equant to tabular.	
Spinel	Tr	Tr	0.05–0.1		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	94.2					Plagioclase needles range in size from 0.05–1.5 mm. Spherulitic textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays (green)	0.6	Olivine, glass.	
Clays (tan)		Spherules, cement.	Pale brown and colorless clays in spherules replace glass.
Clays (tan-brown)		Dessication fissures.	
Zeolite		Glass.	Phillipsite (?), chabazite (?).

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-5R-2 (Piece 1B, 20–23 cm) OBSERVER: IMS WHERE SAMPLED: Unit 10
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0		0.1–0.5		Euhedral, equant.	
Plagioclase	8.8	8.8	0.2–2.5		Euhedral to subhedral, equant to tabular.	
Spinel	Tr	Tr	0.03–0.06		Euhedral, equant.	
GROUNDMASS						
Unspecified	90.0					Plagioclase needle-like quench crystals (0.05–1 mm) sheaf-spherical and branching textures, defined by plagioclase and olivine intergrowths.

SECONDARY MINERALOGY	PERCENT	REPLACING FILLING	COMMENTS
Clays	1	Olivine, plagioclase, veins.	Tan smectite partially replaces olivine. Plagioclase in the groundmass and phenocrysts are partially replaced along the vein margins.
Aragonite	Tr	Vein.	
Zeolite	Tr	Vein, selvage.	Phillipsite (?). Euhedral colorless crystals.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: 1-cm-wide vein of clay and aragonite: clay selvage with blocky aragonite fill, or columnar aragonite with clay fill (columns perpendicular to vein walls). A 0.25-mm vein of tan saponite and phillipsite reopened by larger (1-cm) clay + aragonite vein.

148-896A-5R-2 (Piece 1D, 35–37 cm) OBSERVER: IMS WHERE SAMPLED: Unit 10
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Glassy to fine-grained.
TEXTURE: Glomerophyric, variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.2	1.0	0.2–2		Euhedral, equant.	
Plagioclase	6.8	6.8	0.5–2.0		Euhedral, equant to laths.	
Spinel	Tr	Tr	0.02–0.08		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	92.2					Variolitic zone defined by dendritic growth on plagioclase crystallites in glass zone, to typical spherical varioles into coalesced varioles, and eventually into honeycombed to plumose texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays (Pale brown)	1	Olivine	Olivine is completely altered to pale brown saponite with or without other phases. Alteration incomplete in the glassy rims.
Clays (green)		Veinlets.	In glass.
Clays (yellow-green)		Glass	Palagonite (?)
Pyrite	Tr	Glass	<1–2 um grains in altered glass.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Pillow rim contains fresh glass. A 2–3-mm band of slightly more intense alteration occurs along boundary between glass and varioles. Numerous 0.02–0.05 mm veinlets of green clay in the glass with local replacement of glass by green-green clay (palagonite). Two 0.05-mm veinlets, with very thin green selvages and pale brown clay (saponite) are in the center. Lamellae parallel to vein margins suggest a crack-seal mechanism of formation. Glass inclusions in plagioclase phenocrysts are altered to pale green clays.

148-896A-5R-3 (Piece 1A, 1–5 cm) OBSERVER: IMS WHERE SAMPLED: Unit 10
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to fine-grained.
TEXTURE: Glomerophyric radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.2	0.1–1.2		Euhedral, equant.	
Plagioclase	4	4	0.3–2.0		Euhedral, equant to laths.	Commonly the largest grains occur as single crystals. Some phenocrysts include spinel.
Spinel	Tr	Tr	0.03–0.1		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	94.6					Plumose texture in a honeycomb arrangement and comb textures, defined by plagioclase and olivine intergrowths.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays (Greenish tan)	1.2	Glass.	Palagonite. Replaces interstitial glass in between varioles.
Clays (Pale brown)		Olivine.	Saponite(?).
Aragonite	Tr	Vein.	Blocky and fibrous habits.
Zeolite	Tr	Vein.	Associated with clay in selvage of aragonite-bearing vein.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE
Vesicles					

COMMENTS: The section contains numerous veins. 0.7-mm-wide tan smectite (+ phillipsite prisms) with aragonite at its core and associated brown oxidation halo in the wall rock; 0.02-mm-wide tan smectite vein; 0.02-mm-wide green smectite vein. Clay margins of coarse carbonate vein comprise multiple lamellae of fibrous smectite oriented perpendicular to the vein margins.

148-896A-5R-3 (Piece 8, 63–67 cm) OBSERVER: IMS WHERE SAMPLED: Unit 11
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric, intersertal-intergranular-subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.2	0.2–0.5 mm		Euhedral, equant.	
Plagioclase	7.0	7.0	0.2–2.0 mm		Euhedral, equant to laths.	Biggest grains occur as individual phenocrysts and commonly contain abundant altered glass inclusions.
Spinel	Tr	Tr	0.1–0.2 mm		Euhedral.	Partially resorbed. Commonly as inclusions in plagioclase.
GROUNDMASS						
Unspecified	91.8					Altered glass between plagioclase laths. Clinopyroxene is fresh whereas olivine is altered.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clay (Pale brown)	1.2	Olivine, interstitial material.	Olivine replaced by clays and aragonite. Very abundant replacement of "miarolitic voids" by clay (saponite?).
Aragonite	Tr	Olivive, interstitial material.	With saponite after olivine and voids (?).
Zeolite	Tr	Voids	With clay.
Fe-oxyhydroxides	Tr	Vein, olivine, interstitial material.	In alteration halo adjacent to vein.
Magnetite	Tr	Chrome-spinel	Partial replacement.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: A 0.01-mm bifurcating vein is composed of iron oxyhydroxides and selvage and minor discontinuous dark green clay at the vein center. Segments of vein are devoid of Fe-oxyhydroxides. The vein is rimmed by a 0.15-mm-wide alteration halo, but where the vein is composed of green clay only, no halo is present. Several large (1-mm) miarolitic voids are filled with either clay, zeolite, or aragonite. Glass inclusions in plagioclase phenocrysts are altered to pale brown clay.

148-896A-6R-1 (Piece 5C, 52–54 cm) OBSERVER: IMS WHERE SAMPLED: Unit 12
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.4	0.2–1.2		Equant, euhedral.	Some grains contain spinel. Often associated with plagioclase glomerocrysts.
Plagioclase	7.8	7.8	0.2–4.0		Equant to laths, euhedral.	
Spinel	Tr	Tr	0.02–0.12		Euhedral to anhedral, equant to laths.	
GROUNDMASS						
Unspecified	89.8					Plagioclase as swallowtail and hourglass shaped crystals. Plagioclase and olivine intergrowth define sheaf-spherical, branching, and plumose quench features.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	2.4	Olivine, veinlets.	
Green clay	Tr	Interstitial material.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains one 0.01-mm-wide, pale brown saponite veinlet.

148-896A-6R-2 (Piece 10A, 89–91 cm) OBSERVER: IMS WHERE SAMPLED: Unit 12
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric/radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.4	0.1–0.6		Equant, euhedral.	
Plagioclase	9.0	9.0	0.2–2.0		Equant, laths, euhedral.	Some crystals contain inclusions of devitrified glass.
Spinel	Tr	Tr	0.05–0.15		Euhedral to anhedral.	Occurs often with olivine or adjacent to plagioclase.
GROUNDMASS						
Magnetite		0.001–0.005				
Unspecified	89.6					Plagioclase as swallowtails (0.05–0.8 mm) and skeletal forms. Intergrown plagioclase and olivine define sheaf-spherical, branching, and plumose quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	1.4	Olivine, interstitial.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-6R-2 (Piece 11D, 130–133 cm) OBSERVER: IMS WHERE SAMPLED: Unit 12
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.6	0.3–0.4		Equant, euhedral.	
Plagioclase	7.2	7.2	0.5–2.5		Equant, laths, euhedral.	The largest crystals occur as single individuals.
Spinel	Tr	Tr	0.02–0.07		Euhedral to	Occurs sometimes in plagioclase and anhedral olivine phenocrysts.
GROUNDMASS						
Magnetite		0.001–0.01			Equant	
Unspecified	91.2					Swallowtail plagioclase (0.02–1.5 mm). Plagioclase and olivine intergrowth in sheaf-spherical, and branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan	1.6	Plagioclase.	Partly altered to saponite along vein.
Clays, tan	Tr	Olivine.	Saponite.
Clays, green	Tr	Interstitial.	Tan or green smectite.
Fe-oxides	Tr	Interstitial.	Disseminated, and staining and replacement of plumose.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One 1.5-mm-wide tan smectite vein which is carbonate-bearing, as seen in hand specimen, is completely plucked out here. One 0.05-mm green smectite (nontronite?) vein is observed. Glass inclusions in plagioclase are altered to pale brown clay (palagonite?).

148-896A-6R-3 (Piece 1, 6–9 cm) OBSERVER: IMS WHERE SAMPLED: Unit 12
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.8	0.2–1.5		Equant, euhedral.	
Plagioclase	6.8	6.8	0.5–4.0		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.02–0.10		Euhedral to subhedral, equant.	
GROUNDMASS						
Magnetite			0.001–0.005		Equant.	
Unspecified						Plagioclase as swallowtail needles (0.05–1 mm). Plagioclase and olivine intergrowths define sheaf-spherical and branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.8	Olivine, plagioclase.	Olivine is completely replaced by saponite. Plagioclase is slightly altered to saponite along vein.
Aragonite	Tr	Vein.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One 1.5-mm-wide saponite vein intersects a 7-mm-wide vein of saponite at edges and blocky aragonite at center. The section also contains numerous 0.4-mm-wide saponite veins and one vein of green clay (0.03 mm).

148-896A-7R-1 (Piece 10, 52–55 cm) OBSERVER: IMS WHERE SAMPLED: Unit 13
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Glassy to microcrystalline.
TEXTURE: Porphyritic to glomerophyric, variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.2	0.8	0.2–0.3		Equant, euhedral.	
Plagioclase	4.6	4.6	0.2–0.6		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.02–0.19		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	94.6					Individual to coalesced spherulites in the outer part of variolitic part of a pillow.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	0.6	Olivine, vein.	Olivine grains are partly or completely replaced.
Clay, green	Tr	Glass.	Often colloform palagonite.
Aragonite	Tr	Vein.	
Zeolites	Tr	Glass, veins.	Phillipsite + chabasite(?), see comments below.
Pyrite	Tr	Glass.	Small 0.001–0.005 mm grains in altered glass.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains brecciated altered glass (hyaloclastite, and green clay veins in glass. Veins cementing the breccia are composed of (1) minor green clay (2) euhedral, drusy phillipsite (3) later aragonite and (4) later minor pale brown spherulitic smectite. Clays commonly fill angular voids(?) concentricly. They are coarser grained and more irregular at core.

148-896A-7R-1 (Piece 13, 80–83 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.3	1.6	0.2–0.5		Equant, euhedral.	Fresh olivine in plagioclase glomerocrysts.
Plagioclase	5.2	5.2	0.5–2.0		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.015–0.075		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite			0.001–0.005		Equant.	
Unspecified	93.2					Intergrown plagioclase, olivine, and clinopyroxene make sheaf-spherical, branch, and plumose textures. The latter forms a honeycomb-like pattern.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	1.3	Olivine, interstitial.	
Fe-hydroxides	Tr	Disseminated.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-7R-1 (Piece 22, 135–139 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline - fine-grained.
TEXTURE: Glomerophyric/radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.4	0.5–1.2		Equant, euhedral.	
Plagioclase	5.8	5.8	0.5–2.5		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.03–0.18		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite			0.001–0.005		Equant.	
Unspecified						Swallowtail quench plagioclase up to 1 mm long. Intergrown plagioclase and olivine define sheaf-spherical, branch, and plumose quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	1.4	Olivine, plagioclase.	Complete replacement of olivine. Plagioclase is slightly altered to saponite along vein.
Aragonite	Tr	Vein.	Forms structural fibres, oblique to crystal axes, up to 0.5 mm long and 0.03 mm wide.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One 0.7-mm-wide smectite vein with aragonite at center. A 0.04-mm smectite vein crossing plagioclase crystal which is altered along vein. Several smectite veins (<0.01 mm wide) merging into one 0.5-mm-wide smectite vein.

148-896A-8R-1 (Piece 7, 29–32 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	4.0	0.2–1.5		Equant, euhedral.	
Plagioclase	6.6	6.6	0.5–2.5			
Spinel	Tr	Tr	0.03–0.06		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite	0		0.001–0.01		Equant, skeletal.	
Unspecified	89.4					Swallowtail plagioclase laths (0.05–1.0 mm). Intergrown plagioclase and olivine define sheaf-spherical, branch, and plumose quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING		COMMENTS
Pale brown clays	4.0	Olivine.		Saponite, not abundant.
Yellow clays		Interstitial.		Not abundant.
Fe oxides/hydroxides		Tr	Interstitial.	Local, minor.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-8R-1 (Piece 12, 54–57 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14.
ROCK NAME: Moderately phyric plagioclase basalt.
GRAIN SIZE: Cryptocrystalline to microcrystalline.
TEXTURE: Porphyritic, variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	Tr				
Plagioclase	4.8	4.8	0.4–2 0		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.02–0.06		Euhedral, equant.	
GROUNDMASS						
Unspecified	95.2					Individual to coalesced spherulitic quench textures define the outer part of a variolitic zone in a pillow rind.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale brown saponite	Tr	Olivine, plagioclase.	Olivine is completely replaced in the basalt clast; plagioclase is partly replaced.
Carbonate	Tr		Cementing breccia.
Zeolites	Tr		Associated with smectite.
Pillow glass		Palagonite	Light green, in rim.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One brecciated area is a single calcite crystal (8x5 mm) that is fractured and recemented by angular, anhedral crystals of calcite or aragonite of various sizes. The pillow breccia has smectite selvages. Large crystals are cemented by tan smectite and small crystals of aragonite.

148-896A-9R-1 (Piece 25, 138–141 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.4	0.2–0.3		Euhedral, equant.	Some olivines host spinel inclusions.
Plagioclase	10	10	0.5–3.0		Euhedral, equant to laths.	Some phenocrysts host altered glass inclusions.
Spinel	Tr	Tr	0.02–0.1		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	87.4	87.4				Intergrown plagioclase, olivine, and clinopyroxene define sheaf spherical, branch, and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.4	Olivine and interstitial material.	"Iddingsite" and tan smectite (saponite) after olivine. Interstitial glass or voids replaced by colloform material zoned from light tan or colorless, to brownish green, to green. Very minor in cracks in plagioclase phenocrysts.
Iddingsite	Tr	Plagioclase and interstitial material.	In cracks in plagioclase. On clinopyroxene "combs".

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-10R-1 (Piece 4B, 36–39 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.2	0.15–1.2		Euhedral, equant.	
Plagioclase	9.2	9.2	0.13–1.2		Euhedral, equant laths.	Largest phenocrysts are single crystals.
Spinel	Tr	Tr	0.03–0.15		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	88.6	88.6				Swallowtail plagioclase, from 0.05–0.8 mm in length. Intergrown olivine, plagioclase, and clinopyroxene produce branching and sheaf-spherical quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.2	Olivine and plagioclase.	Olivine completely replaced by tan smectite. Plagioclase partly altered to saponite along veins.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Thin section is cut by up to 0.8-mm-wide vermicular saponite veins. These have been reopened and filled with aragonite, described as granular or sugary in hand specimen. "Fibrous" saponite veins were also recorded.

148-896A-10R-1 (Piece 9C, 116–118 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.0	0.2–0.5		Euhedral, equant.	
Plagioclase	5.0	5.0	0.5–2.0		Euhedral, equant laths.	
Spinel	Tr	Tr	0.02–0.06		Subhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	94.0	94.0				Intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical and branching quench textures. Interstitial glass (?) completely altered. Equant magnetite grains range from 0.001–0.01 mm in diameter.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.0	Olivine and interstitial material.	Saponite (tan smectite) after olivine. Saponite and local nontronite (or celadonite) after interstitial material.
Fe(OH) minerals	Tr	Interstitial material.	Locally developed in association with nontronite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Thin section is cut by a 0.5-mm-wide smectite vein which is zoned from a light green selvage to brown and colorless at its core.

148-896A-10R-1 (Piece 11, 129–134 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.8	0.8	0.1–1.0		Euhedral, equant.	Olivine is mostly fresh.
Plagioclase	9.6	9.6	0.1–2.0		Euhedral, equant laths.	Some crystals host abundant small inclusions of cryptocrystalline material, or more rarely, glass.
Spinel	Tr	Tr	0.02–0.08		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	89.6	89.6				Swallowtail plagioclase, 0.03–0.7 mm length, set in a groundmass of intergrown plagioclase, olivine, and clinopyroxene with sheaf-spherical, comb, and branch quench morphologies.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	Tr	Olivine.	Saponite, associated with Fe-oxyhydroxide minerals in the red oxidized portion of the sample.
Pyrite	Tr	?	Disseminated in dark-gray unoxidized portion of sample.
Fe(OH) minerals	Tr	?	Disseminated in oxidized part of sample.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Thin section is cut by a 0.03–0.1-mm-wide vein composed of Fe-oxyhydroxide and green clay that grades into saponite at the center of the vein. This vein has a red oxidation halo and is cut by a later fibrous carbonate vein. Fine, <0.01-mm-wide Fe-oxyhydroxide veins occur in the alteration halo of the wider vein. Plagioclase phenocrysts are altered along cracks when cut by these veins. Glass inclusions in plagioclase phenocrysts are altered to palagonite(?).

148-896A-11R-1 (Piece 7, 64–71 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14.
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.6	0.2–0.6		Euhedral, equant.	
Plagioclase	5.0	5.0	0.2–1.8		Euhedral, equant laths.	
Spinel	Tr	Tr	0.02–0.1		Euhedral-anhedral, equant.	
GROUNDMASS						
Unspecified	93.4					Swallowtail plagioclase 0.03–1.1 mm in length. Intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical, branching and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.6	Olivine and Plagioclase.	Pale brown saponite.
Fe(OH) minerals	Tr	?	Staining plumose groundmass clinopyroxene.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Thin section cut by a 3–7-mm-wide vein, largely plucked from slide, composed of pale brown saponite on selvages and blocky aragonite in its core. This vein cuts two 1-mm-wide veins with only some brown saponite, perpendicular to vein walls, remaining. The wide vein also crosscuts several 0.05–0.-mm-wide pale brown saponite veins.

148-896A-11R-2 (Piece 3, 30–39 cm) OBSERVER: IMS WHERE SAMPLED: Unit 14.
ROCK NAME: Hyaloclastite.
GRAIN SIZE: Glass.
TEXTURE: Glass, cryptocrystalline.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	?					
Plagioclase	?					

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	Tr	Glass	Replaces and cements glass, partially replaces plagioclase clasts.
Zeolites	Tr	Glass.	Phillipsite(?) Replaces and cements glass fragments.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: This section was not point counted. It consists of an altered glassy breccia (hyaloclastite). Glass shards are coated with colorless smectite (0.01 mm), tan fibrous birefringent smectite (0.05 mm), and phillipsite. Glass shards are also replaced by green birefringent smectite, tan to brown, less birefringent smectite. Some clasts of plagioclase phenocrysts are partly replaced by tan saponite.

148-896A-11R-3 (Piece 3, 12–17 cm) OBSERVER: IMS WHERE SAMPLED: Unit 15
ROCK NAME: Sparsely phyric plagioclase basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.2	0.1–0.3		Euhedral, equant.	
Plagioclase	0.8	0.8	0.1–1.0		Euhedral, equant laths.	
Spinel	Tr	Tr	0.02–0.07		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	99	99				Intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical and branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	0.2	Olivine and interstiial material.	Pale brown saponite after olivine. Minor replacement of plagioclase.
Fe(OH) minerals	Tr	?	Disseminated iron staining.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section cut by a 0.02-mm-wide green and light tan smectite, with very fine-grained sulfide (pyrite or chalcopyrite), vein.

148-896A-11R-3 (Piece 8, 48–53 cm) OBSERVER: IMS WHERE SAMPLED: Unit 16
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	2.2	2.2	0.2–0.6		Euhedral, equant.	
Plagioclase	10.0	10.0	0.5–4.0		Euhedral, laths, equant.	
Spinel	Tr	Tr	0.02–0.14		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	87.8	87.8				Plagioclase as swallowtail quenched crystals, 0.05–1.0 mm. Intergrown plagioclase, olivine, and clinopyroxene define branching plumose and comb quench textures. Magnetite present as 0.001–0.005 mm equant-skeletal grains. Trace sulfides.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	Tr	Olivine and interstitial material.	Pale brown saponite partly replaces olivine.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-12R-1 (Piece 9C, 68–71 cm) OBSERVER: IMS WHERE SAMPLED: Unit 16
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.6	0.2–1.2		Euhedral, equant.	
Plagioclase	7.8	7.8	0.5–3.0		Euhedral, equant, laths.	
Spinel	Tr	Tr	0.04–0.13		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecfified	88.6	88.6				Quenched swallowtail plagioclase, 0.05–1.0 mm. Intergrown plagioclase, olivine, and clinopyroxene define branching and comb quench textures. Magnetite equant-skeletal grains 0.001–0.005 mm.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	3.6	Olivine.	Saponite plus iron oxyhydroxide minerals.
Fe(OH) minerals	Tr	?	Disseminated along micro fractures and interstitial.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The thin section is cut by several 0.03-mm iron oxyhydroxide veinlets.

148-896A-12R-1 (Piece 10B, 78–81 cm) OBSERVER: IMS WHERE SAMPLED: Unit 16
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	5.6	0.2–1.0		Euhedral, equant.	
Plagioclase	9.8	9.8	0.5–2.0		Euhedral, equant laths.	
Spinel	Tr	Tr	0.02–0.12		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	84.6	84.6				Swallowtail plagioclase, 0.05-1.0 mm in length. Intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical, branching, plumose, and comb quench textures. Equant to skeletal magnetite and trace disseminated sulfides are also present.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	5.6	Olivine and interstitial material.	Saponite associated with Fe-oxyhydroxide after olivine. Nontronite/celadonite (green to yellowish orange clays) after interstitial material.
Fe(OH) minerals	Tr	Olivine and interstitial material.	Also disseminated on microfractures.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Interstitial spaces are filled by green clays or Fe-oxyhydroxide minerals in one half of the thin section.

148-896A-12R-2 (Piece 1C, 9–12 cm) OBSERVER: IMS WHERE SAMPLED: Unit 17
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.0	0.1–0 6		Euhedral, equant.	
Plagioclase	11.4	11.4	0.5–2.0		Euhedral, equant, laths.	
Spinel	Tr	Tr	0.02–0.11		Euhedral, anhedral, equant.	
GROUNDMASS						
Unspecified	85.6	85.6				Swallowtail quenched plagioclase, 0.05–1.0-mm. Intergrown plagioclase, olivine, clinopyroxene defining sheaf-spherical, plumose, and comb quench textures. Trace equant-skeletal magnetite, 0.001–0.025 mm.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	3.0	Olivine	Saponite associated with iron oxyhydroxide.
Clays	Interstitial		Red-orange iddingsite the most frequent form.
Fe(OH)minerals	Tr	?	Disseminated along microfractures, staining plagioclase.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-12R-2 (Piece 3, 31–37 cm) OBSERVER: IMS WHERE SAMPLED: Unit 17
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric to porphyritic, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.4	0.1–0 3		Equant, euhedral.	Commonly associated with plagioclase clusters.
Plagioclase	5.8	5.8	0.2–2.0		Equant, laths, euhedral.	The largest are individuals in the groundmass.
Spinel	Tr	Tr	0.03–0.08		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	91.8					Swallowtail plagioclase, 0.05 to 1 mm; intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical, branching, and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.4	Olivine, plagioclase, pore space.	Smectite(?) with first-order birefringence, well-crystallized, replaces olivine and plagioclase. Green clay (nontronite?) fills pores or mm-sized vugs.
Carbonate	Tr	Vugs.	Fibroradial and blocky with clays in vugs.
Chlorite(?)	Tr	Pore space?	Identification of chlorite is tentative: the mineral exhibits weak bluish green pleochroism and low birefringence.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The green "vugs" are 5-mm-diameter patches of vermicular clays, pale green in hand specimen, that are well crystallized and exhibit first-order interference. Several vugs contain carbonate (calcite or aragonite undetermined). The vein is 0.2 mm wide and is filled with colorless fibrous clay with a 0.01-mm-wide green clay selvage. Locally, the selvage is brown-orange (stained with Fe-oxyhydroxides).

148-896A-14R-1 (Piece 2B, 38–41 cm) OBSERVER: IMS WHERE SAMPLED: Unit 18
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS0						
Olivine		1.2	0.2–0.6		Equant, euhedral.	
Plagioclase	10.8	10.8	0.5–3.0		Equant laths, euhedral.	
Spinel	Tr	Tr	0.03–0.11		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite			0.001–0.005		Skeletal, equant.	
Unspecified	88.0					Swallowtail plagioclase, 0.005–1 mm long. Intergrown plagioclase, olivine, clinopyroxene define radiating sheaf, branching, and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.2	Olivine, pore space, plagioclase.	Pale brown saponite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Olivine is completely replaced by saponite, and plagioclase is incipiently replaced by saponite. The section contains two veinlets of colorless saponite, one 0.2 mm wide and the other 0.4 mm wide.

148-896A-14R-2 (Piece 3, 28–31 cm) OBSERVER: IMS WHERE SAMPLED: Unit 19
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.8	0.1–0.5		Equant, euhedral.	
Plagioclase	14.4	14.4	0.5–2.5		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.015–0.10		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	83.8					Swallowtail plagioclase, 0.04 to 0.9 mm; intergrown plagioclase and olivine define sheaf-spherical and branching quench textures. Glass in groundmass is completely altered.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.8	Olivine, plagioclase, and veins.	Olivine completely replaced by saponite; plagioclase is heavily replaced by clay within 0.5 mm of the large vein.
Aragonite	Tr	Vein.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The clay + aragonite vein is >1 cm wide, with light green and tan clay at the margins (up to 7 mm wide) and aragonite (up to 9 mm across) in the center. In addition, there are four or five clay veins, 0.15 to 0.7 mm wide, comprised of tan, typically fibrous clays oriented perpendicular to the vein walls. Plagioclase crystals are brittlely fractured where they are cut by the clay veins.

148-896A-14R-2 (Piece 7, 58–61 cm) OBSERVER: IMS WHERE SAMPLED: Unit 20
ROCK NAME: Sparsely phyric olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.4	0.1–0 4		Equant, euhedral.	
Plagioclase	0.2	0.2	0.2–0.4		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.05–0.08		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	98.4					Swallowtail plagioclase, 0.05 to 1 mm. Plagioclase and olivine intergrown define sheaf-spherical, branching, and comb quench texture. Original interstitial glass is completely altered.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.4	Olivine, plagioclase, interstitial.	Also forms along vein selvage. Completely replaces olivine and some plagioclase cores (rims remain fresh).
Aragonite	Tr	Vein.	Blocky crystals in vein with clay selvage.
Fe-oxyhydroxide	Tr	Interstitial.	Locally disseminated, very fine-grained.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-14R-2 (Piece 16A, 113–115 cm) OBSERVER: IMS WHERE SAMPLED: Unit 21
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.6	0.2–1.0		Equant, euhedral.	
Plagioclase	11.6	11.6	0.5–2.0		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.02–0.13		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	84.8					Swallowtail plagioclase, 0.04 to 1 mm; plagioclase and olivine intergrowths define comb and branching quench textures. Interstitial glass is completely altered.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	3.6	Olivine, plagioclase, interstitial, void.	Pale brown smectite replaces olivine completely, plagioclase partially, and forms interstitially. Green clay replaces interstitial glass and forms in miarolitic voids.
Zeolites	Tr	Vein.	Associated with clay in a vein, forming cubic and prismatic crystals (see comments below).
Fe-oxyhydroxide	Tr	Olivine, groundmass.	Replaces olivine locally along rims, and is irregularly distributed in the groundmass staining plumose clinopyroxene.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One vein is 0.1 to 0.3 mm wide, has a bifurcating pattern, and is comprised of pale brown saponite. The center of the vein is plucked out. Another vein is 0.04 to 0.2 mm wide, and has cubic and prismatic zeolite crystals in the center and pale brown saponite at the selvage.

148-896A-14R-2 (Piece 19, 135–137 cm) OBSERVER: IMS WHERE SAMPLED: Unit 21
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, prophyritic-radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.0	0.2–0.4		Equant, anhedral.	
Plagioclase	9.4		0.5–3.0		Equant, laths, euhedral.	The largest phenocrysts occur as single crystals.
Spinel	Tr	Tr	0.02–0.18		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite	Tr	Tr	0.001–0.025		Equant, skeletal.	
Unspecified	89.6					Swallowtail plagioclase, 0.05 to 1 mm; intergrown plagioclase, olivine, and clinopyroxene define sheaf-spherical, branching, and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.0	Olivine.	Saponite with pyrite replaces olivine in the gray part of the sample, whereas saponite plus Fe-oxyhydroxide replaces olivine in the red-brown zone (see comments).
Pyrite	Tr	Olivine, interstitial.	Size varies from 5 to 20 micrometers in the gray zone of the rock.
Fe-oxyhydroxide	Tr	Disseminated.	Occurs along microfractures in the red zone, and staining plumose clinopyroxene in the groundmass.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None

COMMENTS: A cm-sized red-brown zone of oxidation, has a sinuous contact with the dark gray host rock. The veinlets are 0.01 mm wide, and contain dark brown to orange-brown material.

148-896A-15R-1 (Piece 4, 23–29 cm) OBSERVER: IMS WHERE SAMPLED: Unit 22
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate, subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine		2.4	0.1–0.5		Equant, euhedral.	
Plagioclase	10.2	10.2	0.2–1.9		Equant, laths, euhedral.	
Spinel	Tr	Tr	0.02–0.16		Euhedral to anhedral, equant.	
GROUNDMASS						
Magnetite	Tr	Tr	<0.001–0.001		Equant.	
Unspecified	87.4					Swallowtail plagioclase, 0.05 to 1 mm; intergrowth of plagioclase, olivine, and clinopyroxene define branching and comb quench texture. Beginning stage of subophitic development.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.4	Olivine, plagioclase.	Olivine is completely replaced by tan saponite, and plagioclase is partially replaced by tan saponite.
Fe-oxyhydroxide	Tr	Groundmass.	Minor staining of groundmass.
Chalcopyrite	Tr	Vein.	Associated with colorless smectite in a vein.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The vein is 0.01 mm wide, and contains colorless smectite with accessory grains of chalcopyrite.

148-896A-15R-1 (Piece 15, 101–106 cm) OBSERVER: IMS WHERE SAMPLED: Unit 23
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, porphyritic, radiate-intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.2	0.1–0.5		Equant, euhedral to subhedral.	
Plagioclase	9.8	9.8	0.5–2.5		Equant, laths, euhedral.	The largest crystals occur as single phenocrysts.
Spinel	Tr	Tr	0.01–0.20		Euhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	87.0					Swallowtail plagioclase, 0.03 to 1.1 mm. Plagioclase-olivine intergrowths define comb and sheaf-spherical quench textures. Interstitial glass is completely altered.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	3.2	Olivine, interstitial, vein.	Olivine is completely altered to yellow to colorless or pale brown saponite.
Aragonite	Tr	Vein.	Fibers oriented perpendicular to vein edge.
Fe-oxyhydroxide	Tr	Interstitial, vein selvage.	Very minor.
Sulfide	Tr	Interstitial.	The poor polish prohibits mineral identification.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One vein, 1 mm wide, comprising a discontinuous outer layer of Fe-oxyhydroxide, with colorless to tan saponite within the vein, and fibrous aragonite in the center.

148-896A-16R-1 (Piece 3B, 31–34 cm) OBSERVER: IMS WHERE SAMPLED: Unit 24
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, porphyritic, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.6	0.2–0.5		Equant, euhedral.	Mostly altered.
Plagioclase	5.8	5.8	0.1–1.7		Equant, laths, euhedral.	Glomerocrysts smaller than single phenocrysts.
Spinel	Tr	Tr	0.01–0.10		Euhedral, equant.	
GROUNDMASS						
Magnetite	Tr	Tr	0.001–0.010		Equant, skeletal.	
Unspecified	91.6					Swallowtail plagioclase is 0.03 to 0.9 mm. Intergrown plagioclase, plumose, and comb quench textures.

olivine, and clinopyroxene define sheaf-spherical,

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.6	Olivine, interstitial.	Tan clay replaces olivine, associated with Fe-oxyhydroxide. Green clay fills voids(?) in the groundmass.
Fe-oxyhydroxide	Tr	Olivine, groundmass.	Forms along microcracks with clays and within replaced olivine.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: This is a slightly brownish rock in hand specimen.

148-896A-16R-2 (Piece 4A, 101–105 cm) OBSERVER: IMS WHERE SAMPLED: Unit 24
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate, intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.8	0.2–0.8		Equant, euhedral.	
Plagioclase	9.4	9.4	0.1–1.8		Equant, laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.7		Subhedral, equant.	
GROUNDMASS						
Unspecified	86.8					Interstitial glass altered completely. Radiate texture with comb and branching types occurs. Plagioclase and clinopyroxene form an intergranular texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	3.8	Olivine, plagioclase, interstitial.	Olivine replaced by pale green to tan smectite with dark brown goethite rims. Plagioclase replaced partially in the core by light green to tan smectite. Interstitial areas about 1.5 mm across are replaced by light green to bright green fibrous clays.
Pyrite	Tr	Interstitial.	A single crystal.
Goethite	Tr	Olivine.	Forms rims around olivine crystals that are completely replaced by clay.
Chlorite(?)	Tr	Groundmass.	Minor phase associated with the margins of clay veins, this mineral has weak blue-green pleochroism and low birefringence.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: There are two veins with tan smectite. One is 0.2 to 0.4 mm wide, and the other is 0.02 mm wide.

148-896A-16R-3 (Piece 4B, 88–91 cm) OBSERVER: IMS WHERE SAMPLED: Unit 24
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric to porphyritic; intergranular, subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	8.0	0.2–1.5		Equant, euhedral.	
Plagioclase	8.2	8.2	0.12–2.1			The largest crystals are solitary phenocrysts.
Spinel	Tr	Tr	0.04–0.10		Euhedral to subhedral, equant.	Partly replaced by magnetite.
GROUNDMASS						
Plagioclase	48.6					
Clinopyroxene	26.6					
Olivine	5.0	5.0				
Magnetite	1.4					
Glass	2.0	2.0				Completely altered to clays.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	8.0	Olivine, interstitial.	Olivine is replaced by saponite, Fe-oxyhydroxide, and carbonate.
Interstitial			glass is replaced by smectite and minor carbonate.
Clays	5	Glass.	
Aragonite	Tr	Olivine, interstitial.	
Fe-oxyhydroxide	Tr	Interstitial, olivine.	Staining, disseminated along minor fractures.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: This is a brownish rock. Many plagioclases exhibit an unusual alteration feature: along tiny microcracks through plagioclase, one observes high-order interference colors in cross-polarized light. The cracks are lightly iron-stained in plane-polarized light. It is hypothesized that the cracks are filled with iron-stained carbonate, which is consistent with the carbonate replacement of olivine as well in the thin section.

148-896A-17R-1 (Piece 1A, 1–3 cm) OBSERVER: IMS WHERE SAMPLED: Unit 25.
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	2.8		0.1–0.3		Equant, euhedral.	
Plagioclase	9.8		0.4–2.0		Equant, laths, euhedral.	
GROUNDMASS						
Unspecified	87.4					Swallowtail plagioclase, 0.05 to 0.9 mm. Intergrown plagioclase and olivine define branching and comb quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.8	Olivine, interstitial.	Olivine replaced by tan smectite with iddingsite and, frequently, carbonate.
Carbonate	Tr	Olivine, interstitial.	Disseminated in interstitial voids, and part of the olivine replacement assemblage.
Fe-oxyhydroxide	Tr	Olivine.	Associated with clay and carbonate.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Void fillings(?) consist either of green clay, or a green clay rim followed by tan smectite at the center, or a yellowish green clay followed by orange Fe-oxyhydroxide, and a tan smectite center.

148-896A-17R-1 (Piece 10B, 82–84 cm) OBSERVER: IMS WHERE SAMPLED: Unit 26.
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Porphyritic, glomerophyric, radiate, subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	2.4		0.1–0.2		Equant, euhedral.	
Plagioclase	4.0		0.1–2.0		Equant, laths, euhedral.	
GROUNDMASS						
Unspecified	93.6					Swallowtail plagioclase, 0.04 to 0.9 mm. Plagioclase plus olivine intergrowths define sheaf-spherical and plumose quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.4	Olivine, interstitial.	Green clay with tan fibrous clay at center replaces olivine, and fibrous tan clay replaces interstitial material.
Fe-oxyhydroxide	Tr	Olivine, interstitial.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One half of the thin section has Fe-oxyhydroxide accompanying the replacement of olivine and groundmass, whereas the other half does not have Fe-oxyhydroxide.

148-896A-17R-2 (Piece 3A, 16–19 cm) OBSERVER: IMS WHERE SAMPLED: Unit 27
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	1.8		0.2–0.5		Equant, euhedral.	
Plagioclase	9.8		0.5–1.5		Equant, laths, euhdral.	
Spinel	Tr	Tr	0.07–0.10		Subhedral to anhedral, equant.	
GROUNDMASS						
Unspecified	88.4					Swallowtail plagioclase, 0.03–0.9 mm. Sheaf-spherical, plumose, and some branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.8	Olivine, plagioclase, vein, interstitial.	Olivine replaced by tan smectite with or without Fe-oxyhydroxide rim. Green clays replace interstitial space near the veins. Veins described below.
Phillipsite	Tr	Vein.	
Fe-oxyhydroxide	Tr	Olivine, interstitial, in veinlets.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One vein, 0.08 to 0.12 mm wide, has tan saponite, is associated with several thinner, irregular veinlets of fibrous tan saponite, and has local euhedral phillipsite prisms. Another vein, 0.01 mm wide, is comprised of Fe-oxyhydroxide and tan saponite in one area, by Fe-oxyhydroxide alone in another area, and by green celadonite or nontronite alone in a third area.

148-896A-17R-3 (Piece 8, 89–93 cm) OBSERVER: IMS WHERE SAMPLED: Unit 28
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Cryptocrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	4.2	0.1–0.6		Equant, euhedral.	
Plagioclase	11.2	11.2	0.2–1.5		Equant laths, euhedral.	
Spinel	Tr	Tr	0.05		Anhedral to equant.	
GROUNDMASS						
Unspecified	84.6					Swallowtail plagioclase (0.05 to 1.1 mm). Intergrown plagioclase and olivine define sheaf, spherical, and occasionally plumose quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Tan clays	4.2	Olivine.	Olivine is completely altered. With iddingsite rims.
Green clays		Interstitial.	Green to orange-brown. Does not occur in one part of vein.
Plagioclase			Red stains along aqueous plagioclase cracks. (?)
Iron hydroxide	Tr		

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Veins (0.015 mm wide) are black in the groundmass and sometimes greenish when in plagioclase.

148-896A-17R-4 (Piece 7, 80–84 cm) OBSERVER: IMS WHERE SAMPLED: Unit 28.
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Fine-grained to intergranular.
TEXTURE: Porphyritic, radiate to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	1.4	0.1–0.2		Equant, euhedral.	
Plagioclase	2.8	2.8	0.1–1.0		Equant laths, euhedral.	
GROUNDMASS						
Unspecified	95.8					Swallowtail plagioclase (0.05–1.2 mm). Plagioclase and olivine intergrowths define sheaf-spherical and plumose quench textures. The intergranular minerals between plagioclase laths are clinopyroxene and magnetite.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	1.4	Olivine.	Tan clay occurs with iddingsite, completely replacing olivine.
Clays		Interstitial.	Green clay, varies to red clay with iron staining.
Clay		Veins.	Tan clay with green clay selvages.
Clay		Plagioclase.	Up to 0.6 across along veins.
Chlorite?	Tr		With yellow clays as interstitial void(?) fillings.
Iron hydroxide	Tr	Groundmass.	Disseminated. Very abundant and dark brown in brown halos occurring on one side of the vein.

VESICLES/ CAVITIES	PERCEN	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: A vein (<4 mm wide) contains tan vermicular clay with up to 0.2 mm green clay selvages locally and on only one side. The green clay layer that crosses the vein from one selvage to the other was lost during thin section preparation. The green clay vein, subparallel to selvage in the first vein, has a discontinuous tan clay center. A 0.8-mm-wide tan "fibrous" clay vein has a thin discontinuous green selvage.

148-896A-17R-4 (Piece 9, 99–102 cm) OBSERVER: IMS WHERE SAMPLED: Unit 28
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic, intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.6	0.2–0.5		Equant, euhedral.	
Plagioclase	4.0		0.3–2.5		Equant laths, euhedral.	The largest grains occur as phenocrysts.
GROUNDMASS						
Unspecified	93.4					Plagioclase, clinopyroxene, and magnetite intergranular texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Green clay	2.6	Interstitial.	Voids(?)
Tan clay		Interstitial and olivine.	Sometimes associated with iron hydroxides.
Carbonate		Plagioclase, partially.	
Iron hydroxides	Tr		

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: In a band along one edge of the section, olivine is replaced by iron oxyhydroxides and pale-brown saponite and voids are filled by green "nontronite/celadonite". Outside this zone, olivine is replaced by, and voids are filled with, pale-brown saponite. Glass inclusions in plagioclase phenocrysts are altered to pale-brown clay (palagonite?).

148-896A-17R-4 (Piece 12, 118–123 cm) OBSERVER: IMS WHERE SAMPLED: Unit 28.
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric, porphyritic, radiate, intersertal.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	4.0		0.3–0.5		Equant, euhedral.	Commonly associated with glomerophyric plagioclase.
Plagioclase	12.2		0.5–3 0		Equant, laths, euhedral.	Largest crystals occur as single phenocrysts.
Spinel	Tr	Tr	0.13		Anhedral.	
GROUNDMASS						
Plagioclase	29.2					
Clinopyroxene	33.0					Mostly fresh.
Olivine	19.4					Difficult to distinguish between altered olivine and altered glass.
Magnetite	2.0					

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	4.0	Olivine, interstitial.	Tan clay replaces olivine in the gray portion of the rock; green clay replaces olivine, with Fe-oxyhydroxide, in the red portion of the rock.
Pyrite	Tr	Olivine.	Associated with tan clay replacement of olivine in the gray portion of the rock.
Fe-oxyhydroxide	Tr	Olivine.	Associated with green clay in the red portion of the rock.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The thin section contains a gray portion where olivine is replaced by tan clay and some pyrite. This abuts, with a sharp contact, a reddish zone where olivine is replaced by green clay and iddingsite (Fe-oxyhydroxide). Here, accessory opaque minerals are oxide minerals rather than pyrite. The habit of one oxide segregation within an olivine pseudomorph is identical to the habit of some pyrite in the gray part of the rock. Beyond the reddish part, the rock gradually becomes brownish, characterized by the presence of lesser amounts of Fe-oxyhydroxide.

148-896A-18R-1 (Piece 6B, 72–75 cm) OBSERVER: IMS WHERE SAMPLED: Unit 29
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.8	0.1–1.0		Equant, euhedral.	
Plagioclase	6.2	6.2	0.2–2.0		Equant laths, euhderal.	
Clinopyroxene	Tr	Tr	0.03–0.30		Subhedral to euhedral, equant.	
Spinel	Tr	Tr	0.09		Anhedral, equant.	
GROUNDMASS						
Unspecified.	91.0					Swallowtail plagioclase (0.05–0.9 mm). Intergrown plagioclase, olivine define sheaf-spherical quench texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Pale-brown saponite	2.8	Olivine, interstitial, plagioclase.	Olivine is completely replaced and saponite plagioclase is only partly and rarely replaced.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: One irregular vein was plucked out during thin section preparation. One 0.01-mm-wide clay veinlet parallels a larger one containing tan clay.

148-896A-18R-1 (Piece 8, 83–86 cm) OBSERVER: IMS WHERE SAMPLED: Unit 29
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric, radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	2.0		0.2–0.8		Equant, euhedral.	
Plagioclase	9.0		0.3–2.0		Equant laths, euhedral.	
GROUNDMASS						
Unspecified						Swallowtail plagiocalse (0.05–0.4 mm). Sheaf-spherical and plumose quench textures defined by plagioclase and olivine intergrowths.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays	2.0	Olivine.	Smectite, completely replacing olivine.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Several irregular veins cut and locally brecciate the rock. The veins are 0.04 to <0.01 mm wide and contain tan fibrous smectite when in groundmass and plagioclase crystals (smectite does not replace the plagioclase crystals, however).

148-896A-18R-2 (Piece 10, 60–68 cm) OBSERVER: IMS WHERE SAMPLED: Unit 30
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic, radiate to variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.8	0.3–2.0		Equant, euhedral.	Contain inclusions of groundmass.
Plagioclase	10.6	10.6	0.5–3.0			
GROUNDMASS						
Unspecified	85.6					Swallowtail plagioclase (0.05–1 mm). Intergrowths of plagioclase and olivine define sheaf-spherical to plumose texture at the inner part of the variolitic zone.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING		COMMENTS
Pale-brown saponite	3.8	Olivine.		Replacement is partial in the glassy area and complete elsewhere.
Greenish clay		Glass.	Minor.	Between varioles.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains several green clay veins, 0.01 mm wide. The clay is green in the variolitic zone and light tan elsewhere.

148-896A-19R-1 (Piece 5, 23–25 cm) OBSERVER: IMS WHERE SAMPLED: Unit 30
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.2	0.1–1.6		Equant, euhedral to subhedral.	
Plagioclase	9.2	9.2	0.2–2.0		Equant laths, euhedral to subhedral	
Clinopyroxene	1.0	1.0	0.5–2.0		Subhedral.	Usually corroded.
Spinel	Tr	Tr	0.04		Euhedral.	
GROUNDMASS						
Unspecified	86.6					Swallowtail plagioclase 0.05 to 0.6 mm. Sheaf-spherical quench texture common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, green		Olivine, interstitial.	Olivine is completely altered.
Clays, tan		Olivine, interstitial.	One.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Structure: Incipient formation of pull-aparts is observed in the (damaged) vein. Moderate microcracking is present in of the plagioclase phenocrysts. A vein, with 0.025-mm-wide green clay selvages had a tan clay mineral in the center; it bifurcates into two veins, one 0.008 mm and the other >0.025 mm wide, which disappear into the rock. An irregular veinlet, 0.005 mm wide, contains green clay minerals, and locally, tan and yellow clay minerals. One vein zone is about 0.10 mm wide, and has very irregular and diffuse selvages of fibrous light tan clay minerals.

148-896A-19R-1 (Piece 22, 140–144 cm) OBSERVER: IMS WHERE SAMPLED: Unit 30
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate, intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.4	0.1–1.2		Equant, euhedral to subhedral.	
Plagioclase	8.8	8.8	0.2–2.0		Equant laths, euhedral to subhedral.	
Clinopyroxene	Tr	Tr			Subhedral.	Corroded.
Spinel	Tr	Tr	0.03–0.15		Equant, subhedral to anhedral.	
GROUNDMASS						
Unspecified	88.8					Swallowtail plagioclase 0.05–0.8 mm. Branching quench textures common. Clinopyroxene present as intergranular crystals between plagioclase laths.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan	2.4	Olivine.	With iddingsite.
Clays, green	0.8	Interstitial.	Zoned around light tan core. Tan clays also in interstitial voids and as partial replacement of plagioclase.
Pyrite		Oxidized into goethite.	Large (0.1 mm) inclusion in plagioclase phenocryst.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains a 0.2-mm-wide, green clay vein on selvages (0.01 mm wider). Selvages contain localized patches of iddingsite with fibrous tan centers. The vein ends up as a series of thin (0.01 mm wide) bifurcating veinlets. Fibrous tan clay mineral replaces plagioclase phenocrysts along cracks. There is no evidence of offset along the vein, but moderate cracking of plagioclase is seen.

148-896A-19R-2 (Piece 6, 28–34 cm) OBSERVER: IMS WHERE SAMPLED: Unit 30
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.2	0.15–1.0		Equant, euhedral to subhedral	Some include spinel.
Plagioclase	9.2	9.2	0.2–1.5		Equant laths, euhedral to subhedral.	Some large individual phenocrysts.
Clinopyroxene	Tr	Tr	0.15–3.0		Equant, subhedral.	Commonly corroded.
Spinel	Tr	Tr	0.03–0.15		Equant, subhedral to anhedral.	
GROUNDMASS						
Unspecified	87.6					Swallowtail plagioclase 0.2–1.5 mm. Clinopyroxene and olivine present as intergranular grains between plagioclase. Sheaf-spherical and branching quench textures common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan	Olivine.		Fibrous.
Clays, green	Olivine.		With tan smectite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-20R-1 (Piece 5, 14–20 cm) OBSERVER: IMS WHERE SAMPLED: Unit 30
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	4.4	0.3–1.7		Equant, euhedral to subhedral.	
Plagioclase	9.8	9.8	0.12–2.7		Equant laths, euhedral to subhedral.	
Clinopyroxene	0.2	0.2	0.2–1.0		Equant, subhedral.	Partly resorbed. Encloses plagioclase microphenocryst.
Opaque minerals					Titanium oxide.	Skeletal.
Opaque minerals					Equant, euhedral.	Almost always in interstitial position.
GROUNDMASS						
Unspecified	85.6					Swallowtail plagioclase (0.05–0.3 mm). Clinopyroxene-olivine matrix between plagioclase laths. Sheaf-spherical and combined quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan to brown		Olivine.	Completely replaced. Green smectite occurs as fissure fillings in olivine replaced by tan smectite.
Clays, green			Interstitial.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains radiating minerals (possibly prehnite).

148-896A-20R-1 (Piece 16, 73–77 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	2.4	2.4	0.15–1.2		Equant, euhedral to subhedral.	
Plagioclase	10.2	10.2	0.2–2.5		Equant laths, euhedral to subhedral.	
Clinopyroxene	0.8	0.8	0.4–1.5		Equant, subhedral.	Partly resorbed; encloses plagioclase.
GROUNDMASS						
Unspecified	86.6					Swallowtail plagioclase (0.05–0.6 mm). Sheaf-spherical and branching quench textures common, defined by intergrown plagioclase-olivine. Poorly developed comb texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine, interstitial.	Olivine completely replaced except two crystals (that may be clinopyroxene).

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section reveals intense microcracking of plagioclase.

148-896A-20R-1 (Piece 18, 83-88 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	0.8	0.2–1.0		Equant, euhedral to subhedral.	
Plagioclase	7.0	7.0	0.2–2.0		Equant laths, euhedral to subhedral.	
GROUNDMASS						
Unspecified	92.2					Clinopyroxene and magnetite as intergranular crystals between plagioclase laths. Branching type radiate quench texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, pale buff		Olivine, interstitial and veins.	With or without FeO-OH.
FeO-OH		Olivine, interstitial.	Olivine rims of FeO-OH and around inclusions in olivine. Replaced by smectite and iron oxyhydroxides.
Pyrite		Breccia clasts.	Vugs abundant in breccia matrix and within groundmass of more altered or oxidized clasts.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Sections consists of brecciated basalt with clasts of mixed grain size (from fine to medium). Matrix consists of highly altered basalt and igneous grains with cement of pale, buff-colored smectite and crosscut by smectite grains. Clay minerals replace olivine, plagioclase, and interstitial material in clasts and disaggregated clasts to individual grains. Some cm-sized clasts show boundaries characterized by microbrecciation. There is no evidence of shear (opaque seams, bending of clasts, etc.) or displacement in the breccia.

148-896A-21R-1 (Piece 3, 11–19 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric to porphyritic; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.2	0.1–0.6		Equant, euhedral to subhedral.	
Plagioclase	15.2	15.2	0.15–1.5		Equant laths, euhedral to subhedral.	
Clinopyroxene	0.4	0.4	0.3–1.0		Equant, subhedral.	Commonly corroded.
Spinel	Tr	Tr	0.8		Euhedral.	
GROUNDMASS						
Unspecified	81.2					Swallowtail plagioclase (0.04–0.6 mm). Poorly developed sheaf-spherical and branching quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan to		Olivine, interstitial.	Fibrous, medium birefringence (with or without iddingsite).
Clays, green brown		Goethite and idding site, interstitial.	Also as olivine replacement (with or without iddingsite).
Pyrite	Tr		
Chalcopyrite	Tr		Replacement by tan smectite and iddingsite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section has intense microcracking of plagioclase. Cracks are filled with Fe-hydroxides or oxides.

148-896A-21R-1 (Piece 7, 33–38 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31.
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic; glomerophyric to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.8	0.2–1.2		Equant, euhedral to subhedral.	Often associated with plagioclase glomerocrysts.
Plagioclase	11.4	11.4	0.2–2.5		Equant laths, subhedral.	
Clinopyroxene	Tr	Tr				
Spinel	Tr	Tr	0.02–0.16		Equant, euhedral to subhedral.	
GROUNDMASS						
Unspecified	84.8					Swallowtail plagioclase (0.1–1.0 mm). Clinopyroxene and olivine between plagioclase laths give intergranular texture. Branching-type quench texture common. Comb texture occurs occasionally.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, green			With iddingsite and olivine. All the olivines are completely altered.
Clays, tan			With iddingsite, olivine, and carbonate. All the olivines are completely altered.
Iddingsite		Plagioclase and clinopyroxene.	Stainings on plagioclase and clinopyroxene.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains fibrous veins from 0.2 to 0.8 mm wide. Clays in veins show fiber-like shape. They are arranged along the vein walls with their long axes orthogonal to the vein edges. Carbonate is present as fibers and as crystals with a mosaic texture. Clayey, locally displaced, "inclusion bands" occur within the carbonate "stretched" fibers. Slight kinking seen in the carbonate stretched fibers is always orthogonal to the vein edges. Surface coated with orange iddingsite and colorless clay rim (coating 0.05 mm wide). This is seen on the long side of the section.

148-896A-21R-2 (Piece 3B, 27–29 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	4.0	0.2–0.8		Equant, euhedral to subhedral.	
Plagioclase	10.6	10.6	0.1–3.0		Equant laths, euhedral.	
Spinel	Tr	Tr	0.02–0.20		Equant, euhedral to subhedral.	
GROUNDMASS						
Magnetite			0.001–0.005		Equant, skeletal.	
Unspecified	85.4					Swallowtail plagioclase (0.1–1.2 mm). Sheaf-spherical and branching quench textures, defined by intergrown plagioclase, olivine, and clinopyroxene.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine, plagioclase.	Fibrous; with or without iddingsite.
Clays, green with tan		Olivine, interstitial.	Also on olivine replacement (with or without iddingsite) associated clay mineral; fine-grained aggregates.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains thin vein (0.02 mm wide) of green clay with low birefringence.

148-896A-21R-2 (Piece 9B, 87–89 cm) OBSERVER: IMS WHERE SAMPLED: Unit 31
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Glass and microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	4.2	0.08–2.0		Equant, euhedral to subhedral.	Some grains are fresh or partly to fresh.
Plagioclase	10.8	10.8	0.12–1.2			
Spinel	Tr	Tr	0.05–0.09		Equant, euhedral to subhedral.	In glassy area only.
GROUNDMASS						
Unspecified	85.0					Variolitic to sheaf-spherical and plumose quench textures. (Only the glassy variolitic area considered and point-counted.)

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Smectite, tan		Olivine-plagioclase vein with phillipsite.	In glassy margin (A). Breccia (B) cement with phillipsite. Vein in smectite, fibers perpendicular to the selvage. Vein center, very minor, in part C, with tan deposits at selvage.
Phillipsite		Breccia cement veins in part A.	
Clay, bluish green		Interstitial vein.	In Part C only. (Pleochroic; yellow to bluish green).
Iddingsite		Olivine, plagioclase.	With or without tan saponite "staining" in Part C. Very abundant.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section is composed of three parts ("bands"): (A) Glassy pillow margin (with fresh olivine relict); (B) Breccia with clasts consisting of angular or rounded pieces of plagioclase and clinopyroxene, cement consists of tan smectite and phillipsite; C) Medium-grained basalt. When seen in hand specimen, part C is a clast, part A may be a clast, part B cements C and possibly A. The section contains a number of veins. One vein in part A is 0.4 mm wide and contains discontinuous iddingsite at selvage, phillipsite, and tan saponite (fibroradiate). There are two parallel, 0.2-mm-wide veins; phillipsite (1), tan saponite (2) in part A. In part C, there is one 0.2-mm-wide vein (tan saponite fibers with minor iddingsite at selvage) and one 0.1-mm-wide vein with bluish-green clay at selvage, replaced by iddingsite and tan saponite, parallel to contact between B and C. The veins crosscutting A do not crosscut B. In zone B (breccia), there is no evidence of shear or displacement (i.e., preferred orientation).

148-896A-21R-3 (Piece 4A, 22–24 cm) OBSERVER: IMS WHERE SAMPLED: Unit 32
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic; radiate to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	6.6	0.1–0.3		Equant, euhedral.	
Plagioclase	12.2	12.2	0.1–2.5		Equant, laths, euhedral.	
Clinopyroxene	0.2	0.2	0.2–2.0		Equant laths, euhedral to subhedral.	Most crystals are corroded and contain plagioclase.
Spinel	Tr	Tr	0.02–0.10		Equant, anhedral.	
GROUNDMASS						
Magnetite			<.001–0.005		Equant.	
Unspecified	81.0					Swallowtail plagioclase (0.1–0.8 mm). Radiate quench textures are sheaf-spherical, branching, and comb types, defined by intergrown plagioclase and clinopyroxene.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine, interstitial.	Fibrous, without iddingsite and fine-grained aggregates without iddingsite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-22R-1 (Piece 7A, 64–66 cm) OBSERVER: IMS WHERE SAMPLED: Unit 32
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline, fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	5	0.2–2.0		Equant, euhedral to subhedral.	
Plagioclase	14.8	14.8	0.1–4 0		Equant laths, euhedral to subhedral.	
Clinopyroxene	0.4	0.4	0.2–2.0			Encloses plagioclase grains.
Spinel	Tr	Tr	0.4		Anhedral.	
GROUNDMASS						
Magnetite			0.001–0.001		Equant.	
Unspecified	79.8					Swallowtail plagioclase (0.05–0.4 mm). Radiate quench textures are defined by clinopyroxene or intergrown clinopyroxene.

typically sheaf-spherical and curved comb types. The latter are plagioclase and

SECONDARY MINERALOGY	PERCENT	REPLACING FILLING	COMMENTS
Clays, tan		Olivine and plagioclase, interstitial.	Fibrous, without iddingsite and interstitial fine-grained aggregates.
Fe oxyhydroxide		Disseminated.	Staining groundmass.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains 0.4-mm vein of saponite and phillipsite. Some brecciation is associated with the veins.

148-896A-22R-2 (Piece 18B, 133–134 cm) OBSERVER: IMS WHERE SAMPLED: Unit 33
ROCK NAME: Highly phyric plagioclase olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.2	0.15–0.8		Equant, euhedral to subhedral.	
Plagioclase	16.2	16.2	0.2–4.0		Equant laths, euhedral to subhedral.	
Clinopyroxene	2.0	2.0	0.2–1.6		Equant, euhedral to subhedral.	
GROUNDMASS						
Magnetite			<.001–.005		Equant.	
Unspecified	78.4					Swallowtail plagioclase, 0.02-0.8 mm. Quench textures defined by sheaf-spherical grading into plumose, branching and comb types.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine, interstitial.	Fibrous, groundmass olivine with or without iddingsite. Interstitial aggregates of tan or green fine-grained clay.
Chlorite		Olivine	Bluish-green, traces present.
Pyrite			Scattered in interstitial material.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-22R-4 (Piece 4, 26–29 cm) OBSERVER: IMS WHERE SAMPLED: Unit 33
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Porphyritic to glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine.	0	1.8	0.1–1.2		Equant, euhedral to subhedral.	
Plagioclase	10.6	10.6	0.1–2.0		Equant laths, euhedral to subhedral.	
Clinopyroxene	Tr	Tr	0.1–0.8		Euhedral to subhedral.	
Spinel	Tr	Tr	0.06		Equant, subhedral.	
GROUNDMASS						
Unspecified sheaf-spherical.	87.6					Swallowtail plagioclase (0.01–0.6 mm). Growth texture is typically

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine.	Fibrous or prismatic, with or without iddingsite.
Clays, green		Interstitial.	Partly tan color.
Pyrite		Glass.	Size 10–20 microns; porous aggregates.
Chalcopyrite		Disseminated.	In wall rock of saponite vein; size <1–2 micron grains.
Fe oxyhydroxides		Olivine.	With saponite.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains two veins. One is composed of colorless clay selvages. The other vein has a tan fibrous clay aggregate in the center and green clay selvages (margins). Plagioclase near this vein is altered to pale green clay with low birefringence. Section also contains chilled margins with fresh olivine. Within the vein(s), clays have a fiber like shape and are always oriented at a high angle to the vein edges. There is evidence of some sliding along the fiber boundaries, suggesting that these are extensional veins.

148-896A-22R-4 (Piece 6, 43–49 cm) OBSERVER: IMS WHERE SAMPLED: Unit 34
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Fine-grained.
TEXTURE: Porphyritic; *intergranular to interstitial.*

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	3.6	0.3–1.0		Equant, euhedral to subhedral.	
Plagioclase	6.0	6.0	0.4–2.0		Equant laths, subhedral.	
Spinel	Tr	Tr	0.02–0.05		Equant, anhedral to subhedral.	
GROUNDMASS						
Magnetite	4.2		0.005–0.150		Equant, skeletal.	
Plagioclase	59.0					
Clinopyroxene	16.0					
Olivine	3					
Others	7					Altered interstitial glass and olivine.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine, plagioclase, clinopyroxene.	
Fe oxyhydroxide		Olivine, disseminated.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-23R-2 (Piece 1, 5–7 cm) OBSERVER: IMS WHERE SAMPLED: Unit 35
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to radiate.
TEXTURE: Glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	6.8	0.5–1.6		Equant, euhedral to subhedral.	
Plagioclase	7.6	7.6	0.3–2.0		Equant laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.03–0.12		Euhedral to subhedral, equant.	
GROUNDMASS						
Unspecified	85.6					Clinopyroxene and magnetite as intergranular grains between plagioclase laths. *Branching quench texture.*

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine.	Saponite with Fe-oxyhydroxide and carbonate.
Clays		Interstitial.	Blue-green (chlorite?).
Carbonate		Olivine.	
Pyrite		Olivine, disseminated.	In dark gray host rock.
Chalcopyrite		Interstitial.	

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section is composed of massive basalt with red-brown oxidation halo and gray host rock.

148-896A-23R-3 (Piece 3, 10–20 cm) OBSERVER: IMS WHERE SAMPLED: Unit 36
ROCK NAME: Highly phyric olivine-plagioclase basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	14.2	0.2–2.8		Equant, euhedral to subhedral.	
Plagioclase	10.2	10.2	0.2–2.0		Equant laths, euhedral to subhedral.	Partially altered.
Spinel	Tr	Tr	0.03–0.06		Equant, euhedral.	
GROUNDMASS						
Unspecified	75.6					Clinopyroxene, olivine, and magnetite as intergranular grains between plagioclase laths. Branching-type quench texture.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine.	Olivine completely replaced with iddingsite.
Clays, green		Olivine, interstitial.	Strongly pleochroic; light yellowish tan to green.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section is composed of medium-grained olivine-plagioclase phyric basalt "clasts," cemented by a brecciated basalt. The clasts are angular plagioclase, olivine and clinopyroxene crystals; the cement is a tan clay mineral and iddingsite. The boundary between the basalt "clasts" and "brecciated basalt cement" is either sharp or diffuse. Fresh olivine is relict in the "brecciated basalt cement." Opaque minerals are concentrated in one clast. In the matrix of the breccia, there is a thin zone with reduced grain size that is associated with open fractures.

148-896A-24R-1 (Piece 1, 24–26 cm) OBSERVER: IMS WHERE SAMPLED: Unit 36
ROCK NAME: Moderately phyric plagioclase basalt.
GRAIN SIZE: Fine-grained.
TEXTURE: Glomerophyric; intergranular to subophitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Plagioclase	7.8		0.5–3.2		Equant laths.	
Spinel	Tr	Tr	0.02–0.08		Equant, euhedral to subhedral.	
GROUNDMASS						
Plagioclase	49.8					
Clinopyroxene	16.6					
Olivine	11.6	22.0				
Magnetite	2.4					
Other	1.4					Majority probably altered interstitial glass.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine.	Partially altered; pale green to brown along rim or crosscutting veinlets. (Some brown clays have second-order birefringence.)
Clays		Interstitial.	Pale green to brown smectite.
Pyrite		Groundmass.	Abundant disseminated pyrite with subsidiary chalcopyrite.
Chalcopyrite		Groundmass.	Subsidiary, associated with pyrite (see above).

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAP	COMMENTS
Vesicles						None.

COMMENTS: The sample looks very fresh and contains fresh plagioclase and ophitic clinopyroxene. Olivine is fresh or partially altered. Section contains 0.4-mm subrounded patch of brown clays and fine-grained opaque minerals.

148-896A-24R-5 (Piece 14, 145–148 cm) OBSERVER: IMS WHERE SAMPLED: Unit 36
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; intergranular to radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	3.4	10.8	0.15–4.5		Equant, euhedral to subhedral.	
Plagioclase	22.6	22.6	0.4–4.0		Equant laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.01–0.10		Equant, euhedral.	
GROUNDMASS						
Unspecified plagioclase. texture between the	66.6					Branching quench textures defined by intergrown clinopyroxene and Clinopyroxene, olivine, and magnetite define the intergranular plagioclase laths.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, colorless/tan		Olivine.	Olivine is partly altered with some fresh olivine relicts. Associated with very minor carbonate. Well-crystallized with moderate birefringence.
Carbonate		Olivine.	
Epidote		Olivine, colorless to tan.	Moderate birefringence; well-crystallized.
Fe (OH)n		Iddingsite.	Red stainings along cracks in plagioclase.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains 0.04–0.0-mm-wide vein of pleochroic (green to yellow to dark brown) iddingsite. Section also contains several dark brown to black veinlets <0.04 mm wide. There is a red halo around a gray inner zone that contains the vein and veinlets.

148-896A-25R-2 (Piece 22, 123–124 cm) OBSERVER: IMS WHERE SAMPLED: Unit 37.
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	2.4	0.1–1.0		Equant, euhedral to subhedral.	
Plagioclase	6.4	6.4	0.1–2.0		Equant laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.01–0.05		Equant, euhedral.	
GROUNDMASS						
Unspecified	91.2					Swallowtail plagioclase (0.04–0.6 mm). Branching quench texture common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine.	Saponite.
Clays		Plagioclase.	Slightly altered to saponite.
Pyrite		Disseminated.	Locally abundant; replacing silicates.
Fe oxyhydroxides		Disseminated.	Locally staining groundmass.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

148-896A-27R-1 (Piece 8, 69–71 cm) OBSERVER: IMS WHERE SAMPLED: Unit 43
ROCK NAME: Highly phyric plagioclase olivine basalt.
GRAIN SIZE: Fine-grained.
TEXTURE: Porphyritic to glomerophyric; intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	6.4	0.06–3.5		Equant, euhedral to subhedral.	
Plagioclase	8.4	8.4	0.08–1.6			Largest crystals as single phenocrysts.
Clinopyroxene	Tr	Tr				
Spinel	Tr	Tr	0.02–0.15		Equant, euhedral to anhedral.	
GROUNDMASS						
Unspecified	85.2					Clinopyroxene and magnetite as intergranular crystals between plagioclase laths. Interstitial texture where plagioclase is completely altered to clays.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, tan		Olivine, vesicles, interstitial.	
Clays, green	Tr	Olivine.	Trace mineral with clays replacing large olivine phenocrysts.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles	Tr	Throughout	0.2–0.3	Clay.	Round.	Variably filled by tan or green clay; concentric filling.

COMMENTS: No sulfides or Fe-oxyhydroxides.

148-896A-27R-2 (Piece 13, 109–112 cm) OBSERVER: IMS WHERE SAMPLED: Unit 44
ROCK NAME: Moderately phyric plagioclase-olivine basalt.
GRAIN SIZE: Glass to microcrystalline.
TEXTURE: Glomerophyric; radiate to variolitic.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0.6	1.4	0.08–0.8		Equant, euhedral.	
Plagioclase	7.0	7.0	0.15–4.5		Equant laths, euhedral.	Largest grains occur as phenocrysts.
Spinel	Tr	Tr	0.05–0.06		Equant, anhedral.	
GROUNDMASS						
Unspecified	91.6					Variolitic texture grading inward into plumose and sheaf-spherical quench textures.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays, green, and tan		Glass, olivine, plagioclase.	Both olivine and plagioclase are partially replaced by green and tan clays in the variolitic zone. Glass is partially replaced by green, tan, and yellow clay in the margin.

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: Section contains a 0.01-mm-wide veinlet that cuts the variolitic zone perpendicular to the glassy margin. The veinlet is filled with green clay.

148-896A-28R-1 (Piece 9, 54–58 cm) OBSERVER: IMS WHERE SAMPLED: Unit 47
ROCK NAME: Highly phyric plagioclase-olivine basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate to intergranular.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	0	5.2	0.15–0.8		Equant, euhedral to subhedral.	
Plagioclase	7.2	7.2	0.25–2.5		Equant laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.02		Equant, euhedral.	
GROUNDMASS						
Unspecified	87.6					Swallowtail plagioclase (0.1–1.2 mm). Quench texture defined by sheaf-spherical and comb types. Clinopyroxene and magnetite present as intergranular grains between laths.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine, plagioclase, interstitial.	Tan to green. Olivine completely replaced; plagioclase partially replaced. Partial replacement of plagioclase phenocryst/megacryst. Staining clays, groundmass and edges of olivine grains.
Albite	Tr	Plagioclase	
Fe-oxyhydroxide	Tr		

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains plagioclase laths with clay-filled cracks.

148-896A-30R-1 (Piece 18, 137–141 cm) OBSERVER: IMS WHERE SAMPLED: Unit 51
ROCK NAME: Highly phyric plagioclase basalt.
GRAIN SIZE: Microcrystalline to fine-grained.
TEXTURE: Glomerophyric; radiate.

PRIMARY MINERALOGY	PERCENT PRESENT	PERCENT ORIGINAL	SIZE (mm)	COMPOSITION	MORPHOLOGY	COMMENTS
PHENOCRYSTS						
Olivine	3.0	6.8	0.1–2.0		Equant, subhedral to euhedral.	Fresh olivine occurs with glomerophitic plagioclase.
Plagioclase	9.2	9.2	0.12–4.0		Equant laths, euhedral to subhedral.	
Spinel	Tr	Tr	0.04–0.08		Equant, euhedral to subhedral.	
GROUNDMASS						
Unspecified	84.0					Swallowtail plagioclase (0.08–1.2) sheaf-spherical and branching quench texture common.

SECONDARY MINERALOGY	PERCENT	REPLACING/ FILLING	COMMENTS
Clays		Olivine, interstitial.	Primarily brilliant green clay, with some tan clay. Many olivine pseudomorphs composed entirely of clay.
Fe-oxyhydroxide	Tr	Interstitial.	Red staining.
Opaque oxide minerals	Tr	Olivine, veinlets.	In one area of the section, olivine is partially to completely replaced by opaque oxide minerals. Veinlets extend into groundmass. (Mineral is red and transluscent where thin (may be hematite.)

VESICLES/ CAVITIES	PERCENT	LOCATION	SIZE (mm)	FILLING	SHAPE	COMMENTS
Vesicles						None.

COMMENTS: The section contains numerous tiny veinlets in one area 0.5 mm long and 2 to 3 micrometers wide. These veinlets are filled with a red, reflective, transluscent mineral (hematite?).