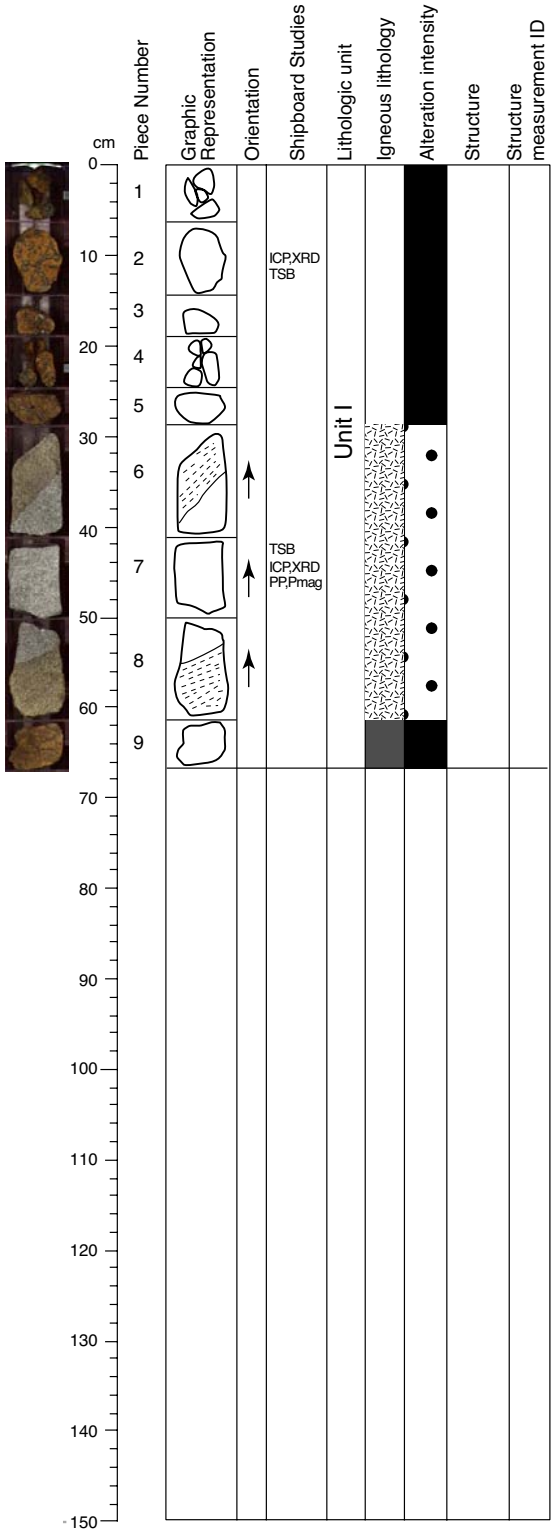
Core Photo



209-1272A-1R-1 (Section top: 0.00 mbsf)

UNIT I: DIABASE

Pieces 1–9

COLOR: Brown to green-gray

PRIMARY MINERALOGY:

Olivine	Mode 89%–98%
Orthopyroxene	Mode <10%
	Size 2–12 mm
	Shape/Habit Anhedral
Spinel	Mode <2%

COMMENTS: This section is composed primarily of altered peridotites (mostly dunite). Pieces 1-5 are harzburgite. Pieces 6 to 8 are microgabbro that has oxidation rinds on the upper surface of Piece 6 and the lower surface of Piece 8. Piece 9 is a dunite.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 20-100
The section contains brown completely altered harzburgite and dunite with a crosscutting dike of moderately altered (20%), fine-grained diabase. Plagioclase in the diabase is slightly altered to chlorite and minor talc, while pyroxene is moderately altered dominantly to green amphibole and chlorite, and olivine is completely altered to talc and magnetite. Brown patches in harzburgite and dunite indicate strong weathering of olivine to clay, carbonate, and Fe-oxyhydroxide. Bins 1 and 4 contain pebbles of fault-breccia with a carbonate matrix. The top 6 cm of Piece 6 show oxidative alteration indicated by brown discoloration of the rock.

VEINS:
The harzburgite and dunite of this section host three different vein generations. Black serpentine-magnetite veins and green picrolite veins are both crosscut by gray vuggy aragonite veins. The diabase in Pieces 6 to 8 contains no veins.

THIN SECTIONS: Sample 1272A-1R-1, 9-12 cm and 1272A-1R-1, 41-43 cm

STRUCTURE: The section consists of a polymictic assemblage of samples consisting of porphyroclastic serpentinized harzburgite (Pieces 1-5, and 9) and coarse diabase or microgabbro (Pieces 6, 7, and 8). All show evidence of seafloor weathering. Diabase or microgabbroic rocks are undeformed and have igneous textures. Serpentinized harzburgites have been affected by moderate to weak crystal-plastic deformation. This section contains little significant brittle deformation. Piece 9 is highly altered and contains relict green serpentine veins and is cut by many late anastomosing shear fractures filled with carbonate. Pieces 1-5 contain green serpentine veins cut by late brittle carbonate veins.

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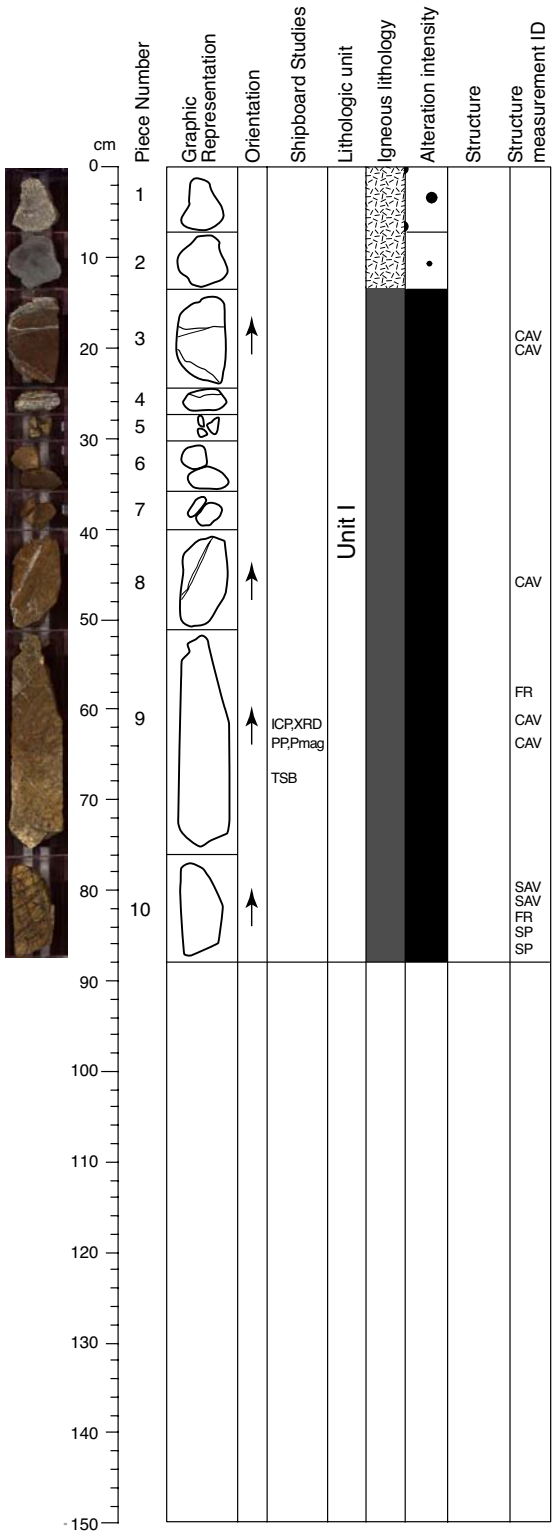

209-1272A-2R-1 (Section top: 12.9 mbsf)

UNIT I: DIABASE

Pieces 1–10

COLOR: Brown to green

PRIMARY MINERALOGY:

Olivine	Mode 98%
Spinel	Mode <2%

COMMENTS: This section is contains primarily altered dunite (Pieces 3-10) with large euhedral crystals of spinel. Pieces 1 and 2 are fine-grained mafic rocks here termed diabase on the assumption they are intrusive. Piece 2 is nearly aphyric with rare grains of plagioclase and clinopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 5-100
At the top of the section, a moderately altered diabase (Piece 1) shows evidence for greenschist-facies alteration (secondary plagioclase, amphibole, and chlorite). Piece 2 is a slightly altered basalt. The lower part of this section contains brown, completely altered dunite. Similar to Section 1272A-1R-1 the serpentinized dunite is variably overprinted by weathering to carbonates, clay, and Fe-oxyhydroxides.

VEINS:
The dunite in the lower part of this section (Pieces 3 to 10) hosts gray vuggy carbonate veins (in particular Pieces 5 to 9). Piece 10 contains early serpentine-magnetite veins that are crosscut by younger gray and brown carbonate-clay veins. The diabase and the basalt at the top of the section host no veins.

THIN SECTIONS: Sample 1272A-2R-1, 66-68 cm

STRUCTURE:
The section consists of a polymict assemblage consisting of varitextured microgabbro (Piece 1), vesicular plagioclase-olivine phyric vesicular basalt (Piece 2), serpentinized dunite (Pieces 8-10) and porphyroclastic harzburgite (Pieces 3-7). Harzburgites show weak crystal-plastic foliations. All pieces show evidence of seafloor weathering and many are cut by late carbonate veins. Pieces 3 and 4 are cut by zones of moderate to high density shear fracture and show incipient brecciation in several locations. The last-formed generation of shear fractures are filled with carbonate. Pieces 8 and 9 are cut by two generations of many fine anastomosing, carbonate-filled dilatational fractures. Piece 10 is cut by conjugate sets of planar shear fractures that appear to be filled with magnetite.

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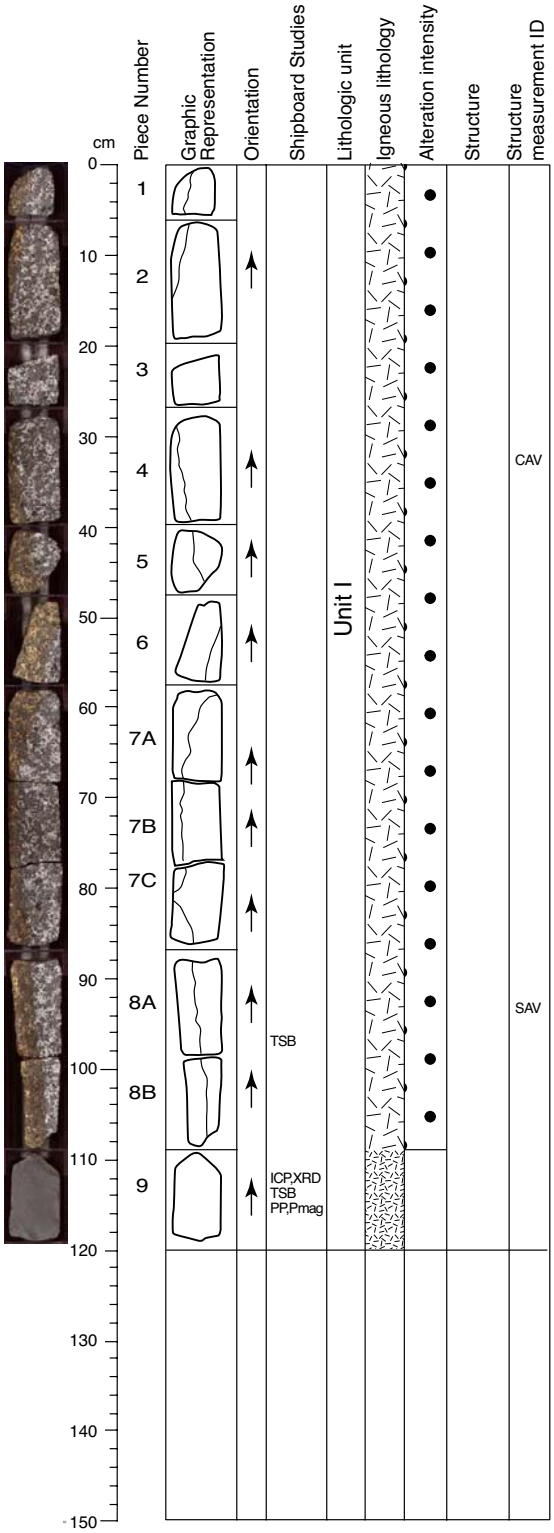

209-1272A-3R-1 (Section top: 17.90 mbsf)

UNIT I: DIABASE

Pieces 1–9

COLOR: Gray to brown

PRIMARY MINERALOGY:

Plagioclase	Mode 55% Size 2–7 mm Shape/Habit Euhedral
Clinopyroxene	Mode 9% Size 2–4 mm Shape/Habit Anhedral
Orthopyroxene	Mode 2% Size 2–4 mm Shape/Habit Anhedral
Oxide	Mode 2% Size 1–2 mm Shape/Habit Anhedral/quench
Olivine	Mode 12% Size 1–3 mm Shape/Habit Poikilitic
Quartz	Mode 5% Size 1–2 mm Shape/Habit Subhedral

COMMENTS: This section contains quartz-olivine gabbro in Pieces 1-8 and basalt in Piece 9. The quartz-olivine gabbro has a quench texture and contains miarolitic cavities (15% in mode) that are lined with small crystals of plagioclase, quartz, oxides, and amphibole.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-20
The first eight pieces of this section are medium-grained, moderately altered diabase (15%-20%). A thin section of Sample 1272B-3R-1, 96-98 cm shows replacement of plagioclase and pyroxene by acicular green amphibole and fibrous chlorite/smectite, preferably along grain boundaries. Minor replacement of plagioclase by albite and quartz and clinopyroxene by talc have also been noted. Acicular, light green needles (possibly actinolite) are developed in vugs. There is a reddish alteration halo running down the section, in which there is some oxidative alteration indicated by red staining of plagioclase. Piece 9 is a gray, fresh basalt.

VEINS:
This section of completely altered/weathered serpentinite host serpentine-magnetite, serpentine and late carbonate veins. The diabase has no veins.

THIN SECTIONS: Samples 1272A-3R-1, 96-98 cm and 1272A-3R-1, 111-114 cm

STRUCTURE:
The section consists of oikocrystic diorite (called quartz-olivine gabbro above) (Pieces 1 through 9) and coarse diabase or microgabbro (Piece 10). All show evidence of seafloor weathering. Pieces have not experienced crystal plastic deformation and have igneous textures. This section contains no brittle deformation features. Piece 4 contains one chlorite vein.

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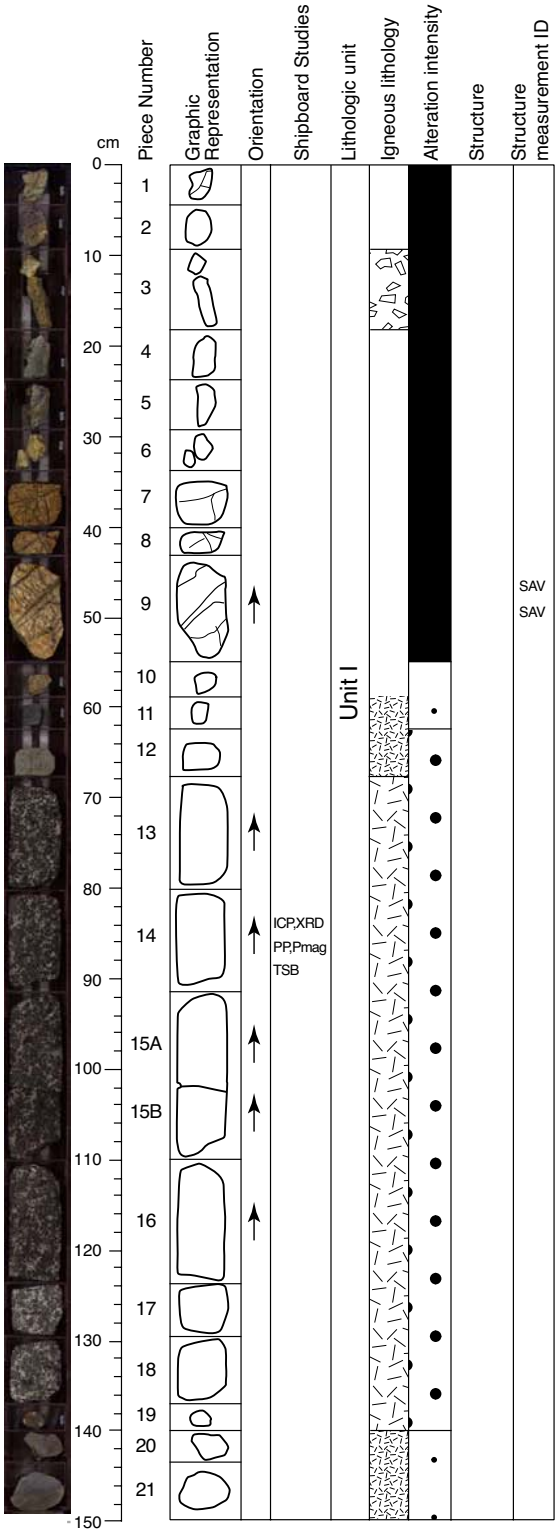

209-1272A-4R-1 (Section top: 22.4 mbsf)

UNIT I: DIABASE

Pieces 1–21

COLOR: Orange to brown

PRIMARY MINERALOGY:

Olivine	Mode 98%
Orthopyroxene	Mode 2%
	Size 1–4 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This section consists of altered peridotite in Pieces 1-10, small pebbles of diabase in Pieces 11-12, and 20-21 and a succession of quartz-olivine gabbro in Pieces 13-19 that is similar to that described in Section 1272A-3R1.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 3-100
The first ten pieces of this section are completely altered orange-brown dunite. Black serpentine-magnetite veins are present. In some intervals the rock appears highly weathered (in particular Pieces 1, and 6-10), with clay, carbonate, and Fe-oxyhydroxide replacing olivine. Piece 3 is a carbonate-cemented fault breccia. Pieces 11 and 12 are gray, slightly altered basalts with highly clay-altered olivine phenocrysts and incipiently altered plagioclase phenocrysts and mesostasis. Pieces 13 to 19 are diabase, similar to the ones in Section 1272A-3R-1, Piece 1-8, but without oxidation halos. The extent of alteration in the diabase is about 15%, and green amphibole and chlorite/smectite are the dominant secondary phases. Pieces 20 and 21 are gray, slightly altered (3%) basalt/diabase with 50% alteration of olivine microphenocrysts to clay and Fe-oxyhydroxide and incipient plagioclase alteration to clay.

VEINS:
Serpentinites host carbonate veins. The basalt and diabase of this section host no veins.

THIN SECTIONS: Sample 1272A-4R-1, 87-90 cm

STRUCTURE:
The section consists of a polymict assemblage consisting of varitextured microgabbro (Piece 12), basalt (Pieces 11 and 20) serpentinized dunite (Pieces 1, 3, and 7-10), porphyroclastic harzburgite (Pieces 4-6), poikiolitic diorite (Pieces 13-19), and sedimentary breccias (Pieces 2 and 3). Harzburgite shows weak crystal-plastic foliations. Dunites are free of pyroxene or other markers by which to assess strain. All other samples have not experienced crystal-plastic deformation. Most pieces show evidence of seafloor weathering. This section contains significant degrees of brittle deformation. Pieces 1 and 2 contain moderate densities of shear fractures with little or no offset. Pieces 3 and 6 are small chips of non-foliated, cohesive, carbonate-matrix breccia. Subrounded to angular clasts of serpentinite and possible basalt are supported by a very fine-grained matrix of orange carbonate. These are probably part of the same breccia observed in 1272A-5R0-1 (Pieces 7 and 9), which are interpreted as sedimentary breccias. Pieces 2, 4, and 5 are serpentinite with a distinct schistose foliation; these are possibly semi-brittle shear zones. Pieces 7-10 contain two generations of magnetite-filled fractures and zones of incipient brecciation.

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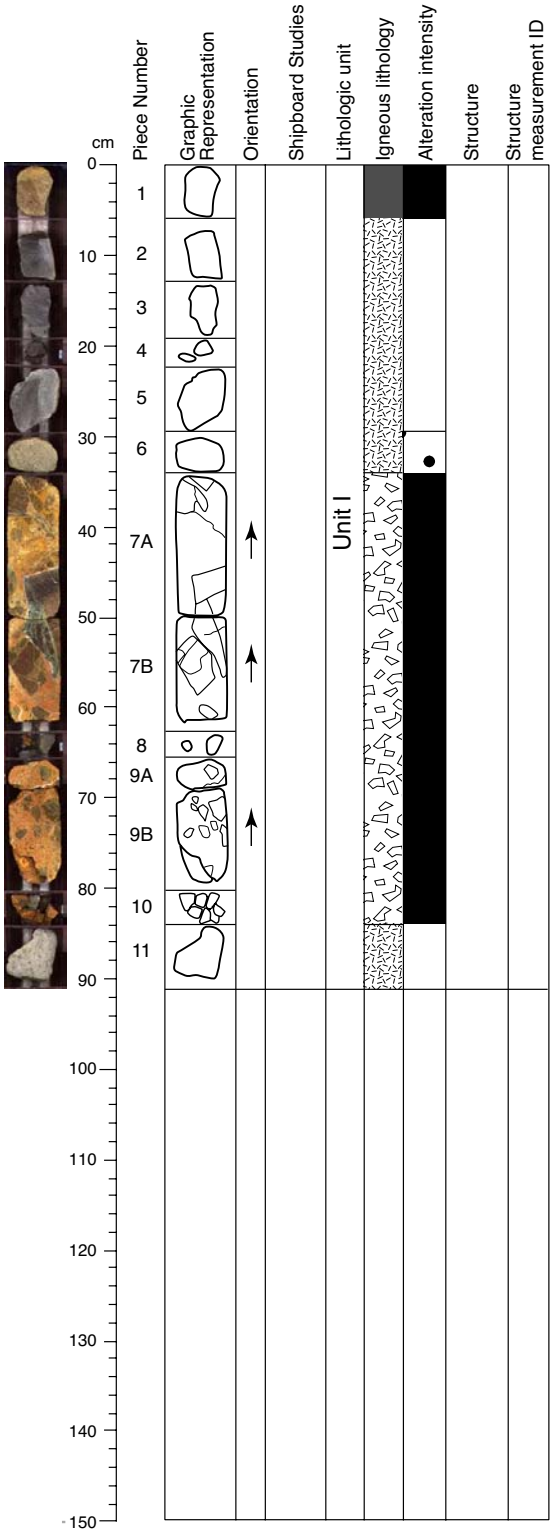

209-1272A-5R-1 (Section top: 27.40 mbsf)

209-1272A-5R-1 (Section top 27.40 mbsf)

UNIT I: DIABASE

Piece 1–11

COLOR: Orange to brown

PRIMARY MINERALOGY:

Olivine	Mode 9 %
Orthopyroxene	Mode 2%
	Size <1 mm
	Shape/Habit Anhedral

COMMENTS: This section consists of altered dunite (Piece 1), fragments of diabase (Pieces 2-6, and 11), and altered brecciated dunite (Pieces 7-10). The diabase in Piece 11 is distinct from that in Pieces 2-6 in that it has a mottled appearance.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 20-100
This section consists of completely altered dunite with notable weathering to carbonate, clay, and Fe-oxyhydroxide (Piece 1), fresh (Pieces 2-5, and 11) to moderately altered (Piece 6) basalt, and a serpentinite breccia (Pieces 7-10). The serpentinite breccia has angular clasts of completely serpentinized porphyroclastic harzburgite and dunite. Many fragments are surrounded by a mm-wide layer of aragonite. The breccia cement is orange clay, carbonate, and Fe-oxyhydroxide.

VEINS:
This section hosts carbonate veins with black clay (celadonite?). A cross-fiber carbonate vein in Piece 9 is does not cut fragments of altered serpentinite. The basalt pieces of this section host no veins.

STRUCTURE:
The section consists of a polymict assemblage consisting of diabase (Piece 1), basalt (Piece 2-5, 8, and 11), serpentinized dunite (Piece 1), and sedimentary breccia. All pieces show evidence of seafloor weathering and many are cut by late carbonate veins. No evidence of crystal plastic deformation could be observed in the section. Pieces 7, 9 and 10 are coarse-grained, cohesive, non-foliated breccia. Angular to subangular clasts of serpentinite and minor basalt are supported by a fine-grained, orange, carbonate-rich matrix. The breccia is carbonate cemented and is likely sedimentary, however, it contains portions of clasts that originated along a fault zone as evidenced by protocataclasite within ultramafic clasts of Piece 7. These clasts are visibly deformed by this semi-brittle processes that pre-dated the formation of the sedimentary breccia, indicating breccia probably lithified at the base of a fault scarp. This sedimentary breccia is cut by late brittle carbonate veins and each clast is surrounded by a coating of carbonate vein infill, probably caused by matrix shrinkage upon tectonic activity or dewatering and lithification.

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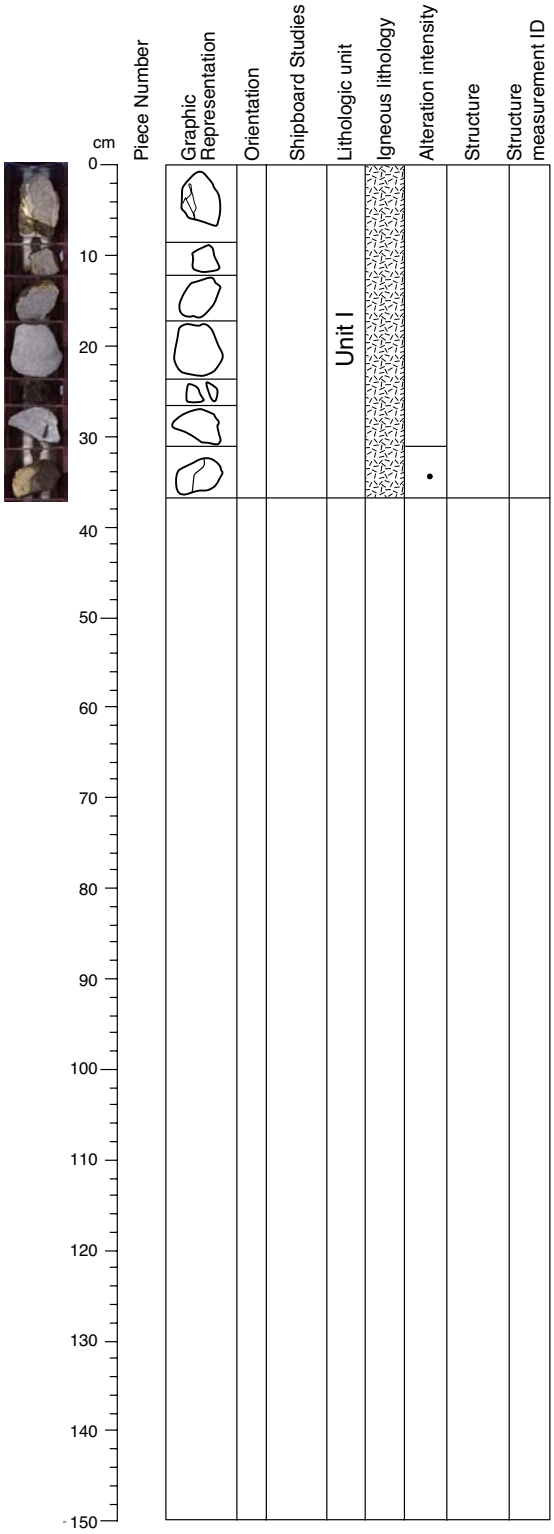

209-1272A-6R-1 (Section top: 31.9 mbsf)

UNIT I: DIABASE

Piece 1–7

COLOR: Gray

PRIMARY MINERALOGY:
COMMENTS: This section consists mostly of diabase with various grain sizes. Pieces 2-3 are plagioclase-phyric while Pieces 4-5 are aphyric. Piece 6 is classified as a microgabbro based on its slightly larger grain size.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-5
The first five pieces of this section are gray, fresh basalts with no visible alteration. Piece 6 is a slightly altered, gray to red basalt with clay and Fe-oxyhydroxide alteration of olivine microphenocrysts.

VEINS:
No veins.

STRUCTURE:
The section consists of basalt (Pieces 1-6) and diabase (Piece 7). Most pieces show evidence of seafloor weathering. All textures are igneous and there are no brittle deformation features or alteration veins in this section.

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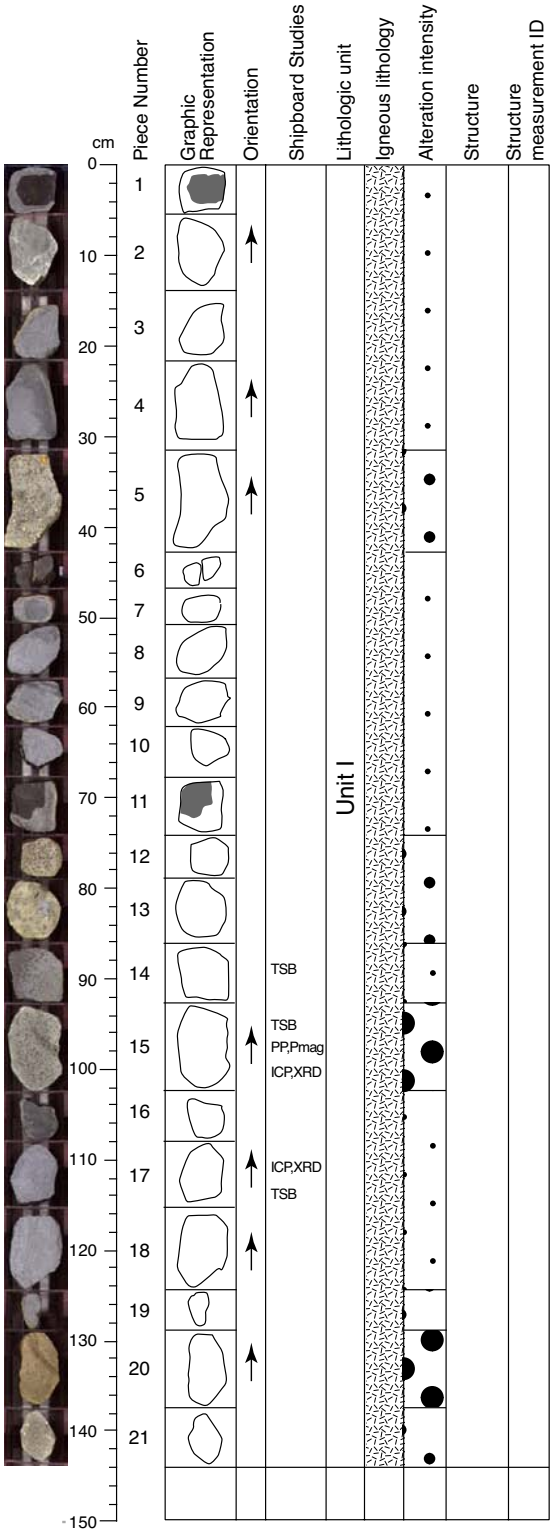

209-1272A-7R-1 (Section top: 36.90 mbsf)

UNIT I: DIABASE

Piece 1–21

COLOR: Gray to green-brown

PRIMARY MINERALOGY:
COMMENTS: This section consists of fine-grained mafic rocks that can be subdivided based on their grain size and textures. Pieces 1, 2, 4, 6-11, 13-14, and 16-19 are aphyric and likely were formed by quenching of basaltic liquid. Pieces 3, 5, 12, 15, and 20-21 are diabase and may represent the interior parts of intrusions bounded by the quenched samples.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 5-60
This section is composed of gray to green-brown variably altered basalt. In hand specimen, the gray spherulitic basalt does not show visible alteration. However, thin sections of Sample 1272A-7R-1, 87-89 cm, and 113-115 cm, indicate 5%-9% alteration of glass to very fine-grained brown to gray clay. Pieces 5, 12-13, 19, and 21 are moderately altered, while Pieces 15 and 20 are highly altered basalt. A thin section of Sample 1272A-7R-1, 94-96 cm (Piece 15) reveals 60% alteration of microphenocrysts and mesostasis to green amphibole and chlorite/smectite.

VEINS:
No veins.

THIN SECTIONS: Samples 1272A-7R-1, 87-89 cm, 1272A-7R-1, 94-96 cm, and 1272A-7R-1, 113-115 cm

STRUCTURE:
Most pieces show evidence of seafloor weathering. All textures are undeformed igneous textures and there are no brittle deformation features or alteration veins in the section.

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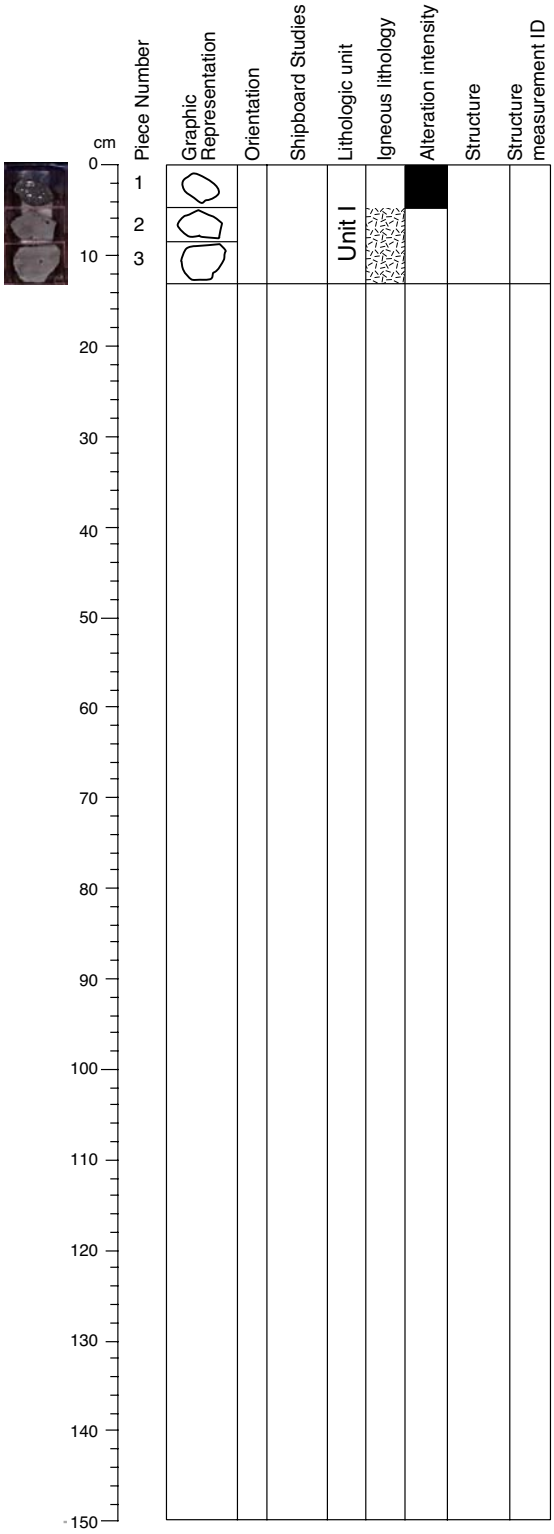

209-1272A-8R-1 (Section top: 41.40 mbsf)

UNIT I: DIABASE

Pieces 1–3

COLOR: Brown

PRIMARY MINERALOGY:
HARZBURGITE 85%

Olivine	Mode 98%
Orthopyroxene	Mode 15%
	Size 0.5–3 mm
	Shape/Habit Anhedral
Spinel	Mode <1%

COMMENTS: This short section consists of small pebbles of altered harzburgite in Piece 1 and aphyric diabase in Pieces 2-3.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
This section consists of completely altered harzburgite (Piece 1), in which olivine is replaced by serpentine and minor magnetite and talc while orthopyroxene is pseudomorphed by talc with minor serpentine. Pieces 2 and 3 are fresh, gray basalt. Colorless zeolite needles decorate the wall of a vug in Piece 3.

VEINS:
No veins.

STRUCTURE:
The section consists of serpentinized harzburgite (Piece 1) and aphyric basalt (Pieces 2 and 3) that show evidence of seafloor weathering. The harzburgite has undergone crystal plastic deformation. There are no brittle deformation features or prominent alteration veins in this section.

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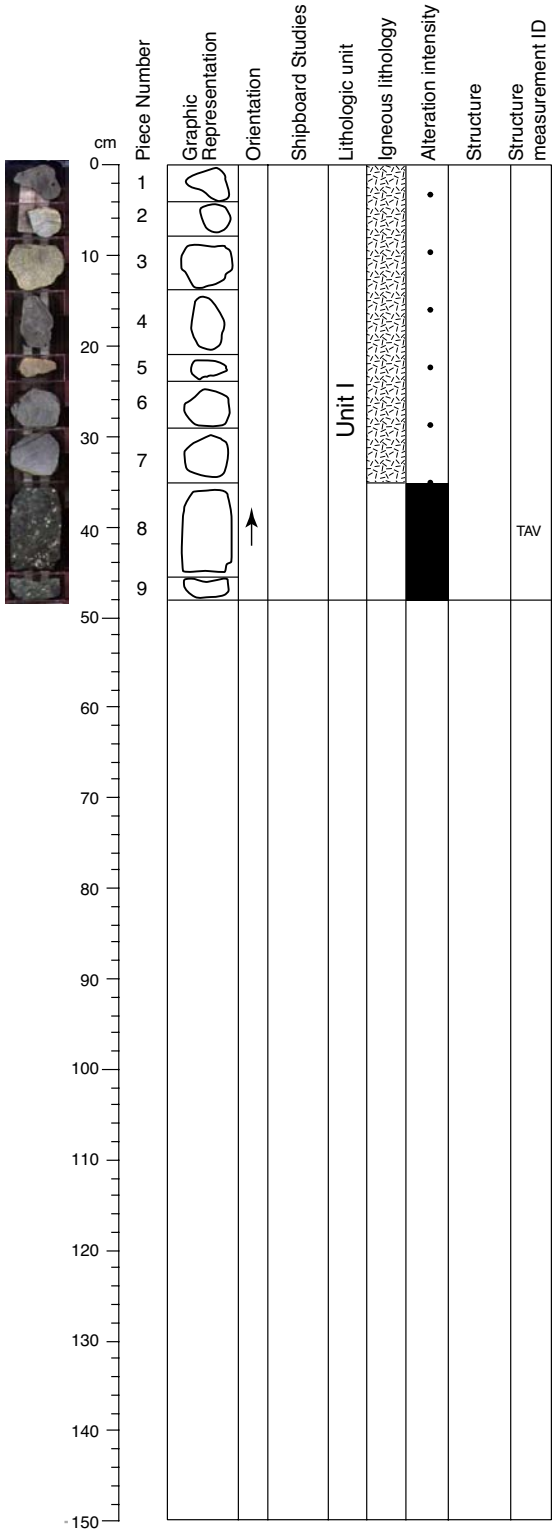

209-1272A-9R-1 (Section top: 44.4 mbsf)

UNIT I: DIABASE

Piece 1–9

COLOR: Gray

PRIMARY MINERALOGY:

Olivine	Mode 78%–83%
Orthopyroxene	Mode 15%–20%
	Size 2–8 mm
	Shape/Habit Anhedral
Spinel	Mode 2 %

COMMENTS: This short section consists of aphyric diabase in Pieces 1, and 4-7, holocrystalline diabase in Pieces 2-3 and altered harzburgite in Pieces 8-9. The aphyric diabase in Pieces 1 and 4-7 contain <3% vesicles. The altered harzburgite has protogranular to porphyroclastic texture.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
This section consists of fresh to slightly altered basalt. Pieces 1, 4. and 5 to 6 are fresh gray basalt. Pieces 2, 3, and 5 are slightly altered with partial replacement of olivine microphenocrysts by clay and Fe-oxyhydroxides and incipient clay alteration of plagioclase microphenocrysts and mesostasis. Pieces 8 and 9 are completely serpentinized, green-gray harzburgite (99% serpentine, 1% magnetite), with a network of serpentine and magnetite veins and transgranular chrysotile veins.

VEINS:
The basalt of Pieces 1 to 7 has no veins. Pieces 8 and 9, completely altered harzburgite, host short green picrolite veins that are cut by white chrysotile veins.

STRUCTURE:
The section contains a polymict assemblage of basalt (Pieces 1 and 4-7), diabase (Pieces 2 and 3), and highly serpentinized and altered harzburgite. All samples show evidence of seafloor weathering. Fabric elements could not be recognized in the harzburgite because of the extreme stage of alteration and weathering. Late small, (0.1mm wide) talc veins cut Piece 8. This section contains only very minor brittle deformation features.

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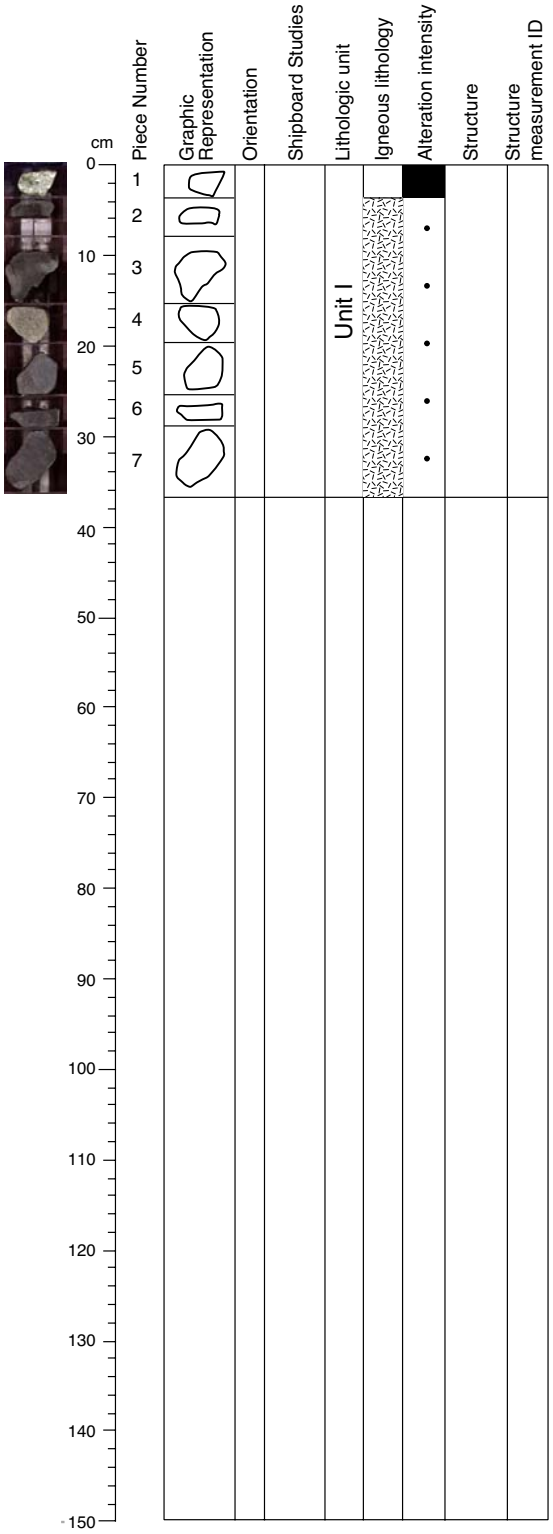

209-1272A-10R-1 (Section top: 46.40 mbsf)

UNIT I: DIABASE
Pieces 1–7

COLOR: Green-gray

PRIMARY MINERALOGY:
HARZBURGITE

Olivine	Mode 80 %
Orthopyroxene	Mode 20 %
	Size 1–5 mm
	Shape/Habit Anhedral
Spinel	Mode <1%

COMMENTS: This short section consists of altered harzburgite in Piece 1, diabase in Pieces 2-5, and aphyric diabase in Pieces 6-7.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
This section is composed mainly of fresh to slightly altered basalt. Only Piece 4 shows visible alteration of olivine to dark green clay and incipient clay alteration of plagioclase and mesostasis. Piece 1 is a completely altered harzburgite with serpentine-magnetite after olivine and serpentine and abundant carbonate after orthopyroxene.

VEINS:
No veins.

STRUCTURE:
The section contains a polymict assemblage of basalt (Pieces 2, 3, 6, and 7), diabase (Pieces 4 and 5), and highly serpentinized and altered harzburgite (Piece 1). All samples show evidence of seafloor weathering. Fabric elements could not be recognized in the harzburgite because of the extreme stage of alteration and weathering. There are no brittle deformation features and no alteration veins in this section.

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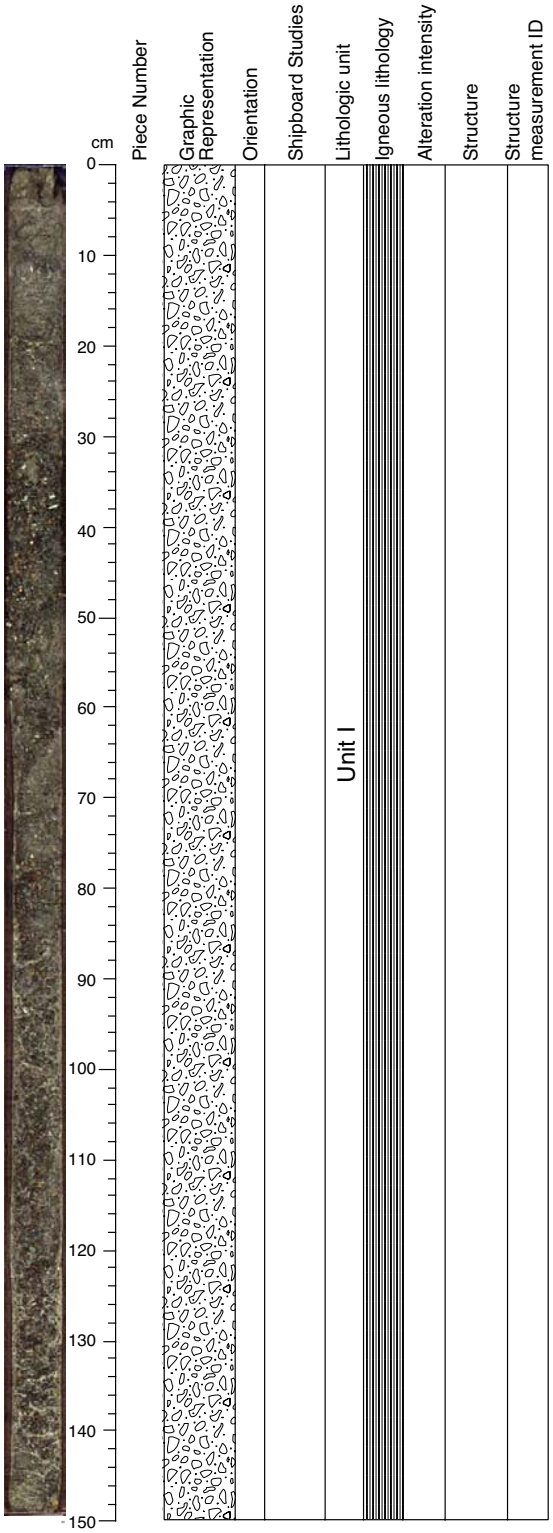


209-1272A-11R-1 (Section top: 51.0 mbsf)

UNIT I: Diabase

Piece 1

COLOR: Gray to green

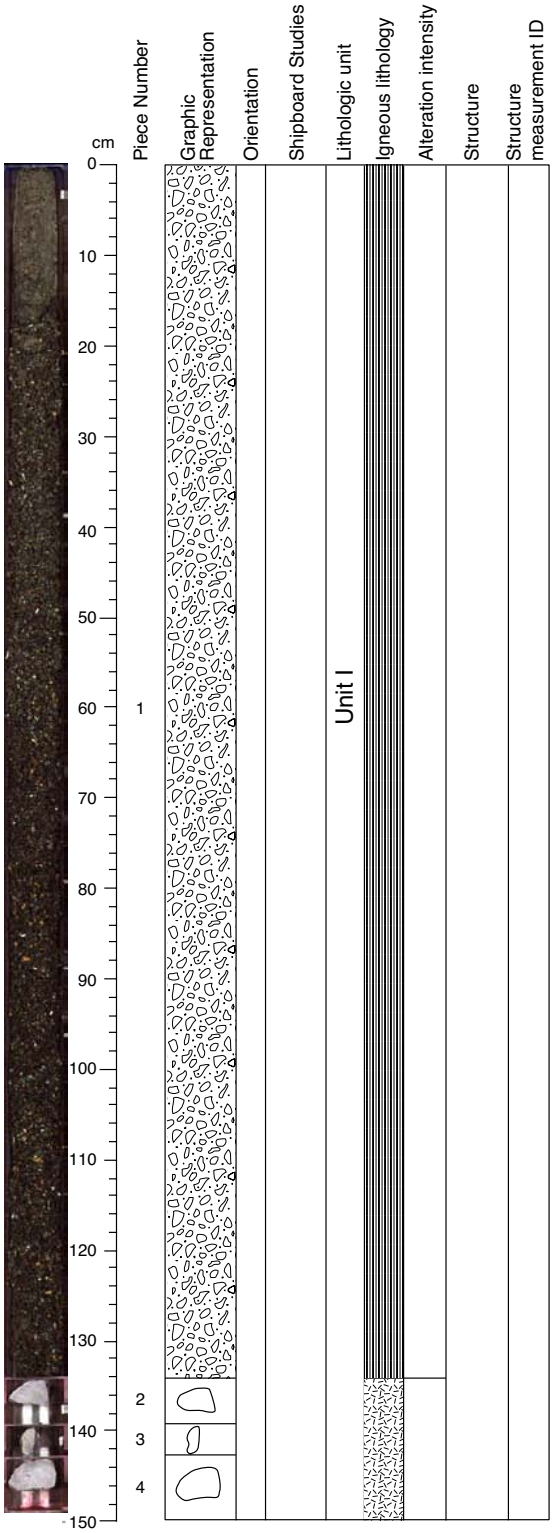
PRIMARY MINERALOGY:
COMMENTS: This section is composed of sand and gravel that appears to have been derived by crushing of serpentinized peridotite.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 100
This section entirely consists of gravel and mud. Largest pieces are about 5 mm in diameter and can be identified as variable altered basalt, peridotite, and fragments of pyroxene crystals.

VEINS:
No veins.

STRUCTURE:
Probable cuttings produced during drilling.Numerous particles of serpentinized harzburgite, dunite, pyroxene and serpentine vein material.

Core Photo



209-1272A-11R-2 (Section top: 52.5 mbsf)

UNIT I: Diabase

Pieces 1–4

COLOR: Gray to green

PRIMARY MINERALOGY:

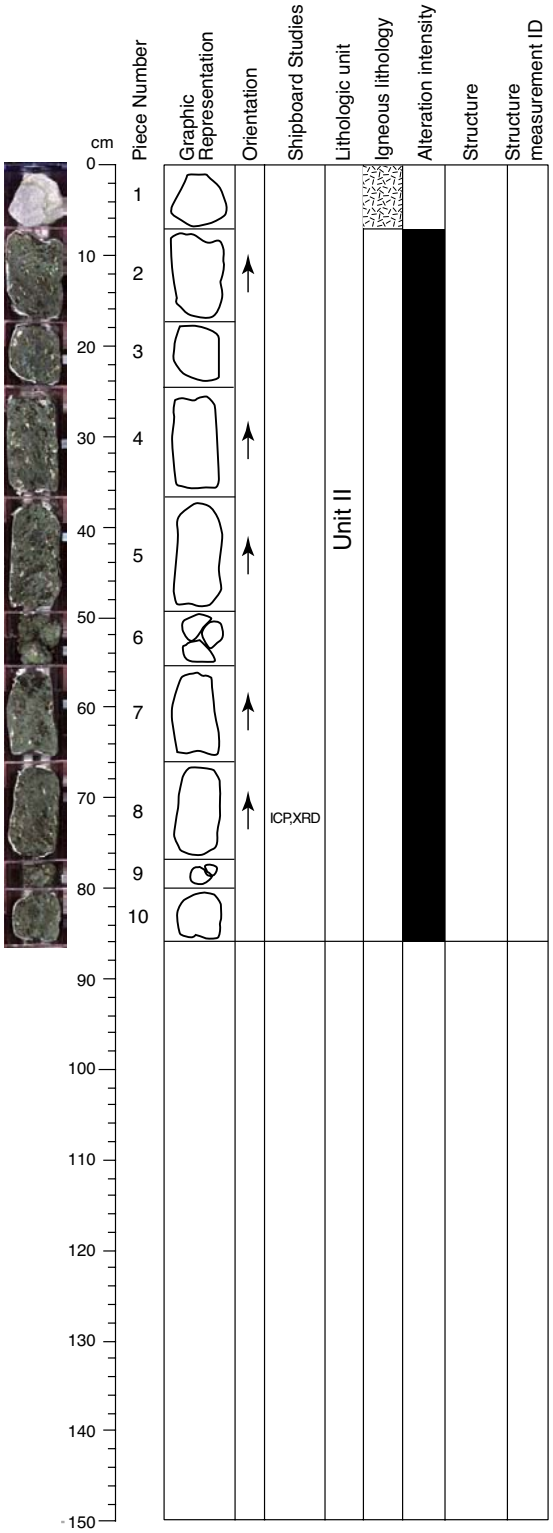
COMMENTS: This section is composed primarily of sand and gravel that appears to have been derived by crushing of serpentinized peridotite. Pieces 2-4 are aphyric diabase and Piece 3 has 1% vesicles.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
The first bin of this section consists of gravel and mud. Largest pieces are about 5 mm in diameter and can be identified as variable altered basalt, peridotite, and fragments of pyroxene crystals. Pieces 2 to 4 are fresh basalt with incipient oxidative alteration in a halo of Piece 2.

VEINS:
No veins.

STRUCTURE:
Probable cuttings produced during drilling. Particles consist mostly of serpentinized harzburgite, dunite, pyroxene and serpentine vein material. Pieces 2 to 4 are vesicular basalt with igneous textures and no evidence of deformation. Basalt shows evidence of seafloor weathering.

Core Photo



209-1272A-12R-1 (Section top: 56.0 mbsf)

UNIT II: HARZBURGITE

Piece 1–10

COLOR: Gray

PRIMARY MINERALOGY:

Olivine	Mode 89%
Orthopyroxene	Mode 10%
	Size 1–15 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

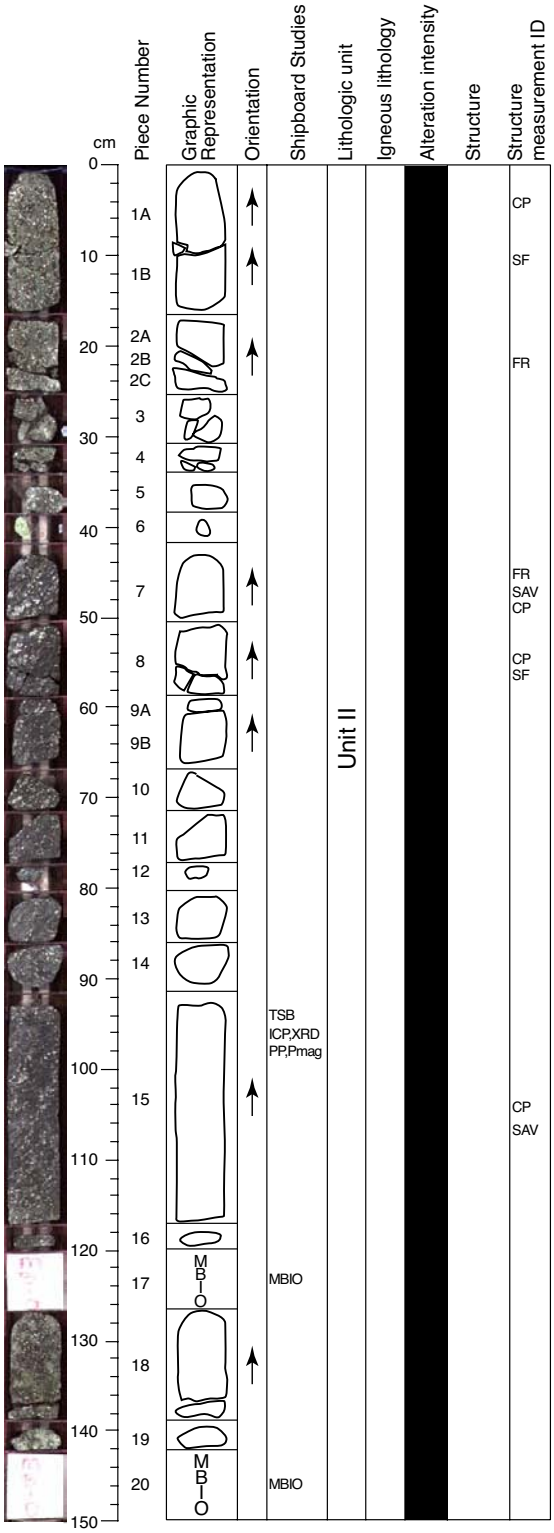
COMMENTS: This section contains aphyric diabase in Piece 1 and altered harzburgite in Pieces 2-10 that has a protogranular texture.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
This section is composed of unusually soft, green harzburgite that appears entirely clay-altered. Texturally it is similar to harder altered harzburgite in Hole 1272A. Olivine is replaced by green clay, while orthopyroxene is replaced by white to green clay. Carbonate does not appear to be present in noticeable amounts. Piece 1 is a fresh basalt (1% alteration), in which olivine phenocrysts are completely altered to dark green smectite and a trace of Fe-oxyhydroxide.

VEINS:
No veins.

STRUCTURE:
The section recovered a basalt (Piece 1) and then Pieces 2-10 consisting of highly altered harzburgite. The harzburgite, although appearing intact, had consistency of mud and could deform plastically with any small pressure applied (e. g., finger touch). When dried the core material consolidated somewhat, but became brittle and friable. It is likely that the state of the samples indicate that they were part of a weathering or extreme alteration zone at the top of a harzburgite basement. X-ray diffraction data shows that these unusually altered harzburgite contain iowaite, a brucite-like, Cl-bearing mineral with a layered structure, which is an unusual alteration phase. The significance of its occurrence is that it is thought to indicate oxidizing conditions that could be satisfied by seawater at or near the seafloor. Iowaite is unlikely to be the cause of the unusual plastic rheology of the harzburgites. Serpentine minerals may form muds that are unusually weak. The state of the samples are too poor to establish primary structural relationships.

Core Photo



209-1272A-13R-1 (Section top: 60.7 mbsf)

UNIT II: HARZBURGITE

Pieces 1–20

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 75%–90 %
Orthopyroxene	Mode 15%–30%
	Size 1–15 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: This section consists of altered harzburgite with protogranular texture. Orthopyroxenes frequently enclose vermicular spinel. The mode of orthopyroxene varies between 10% and 30% along the section.

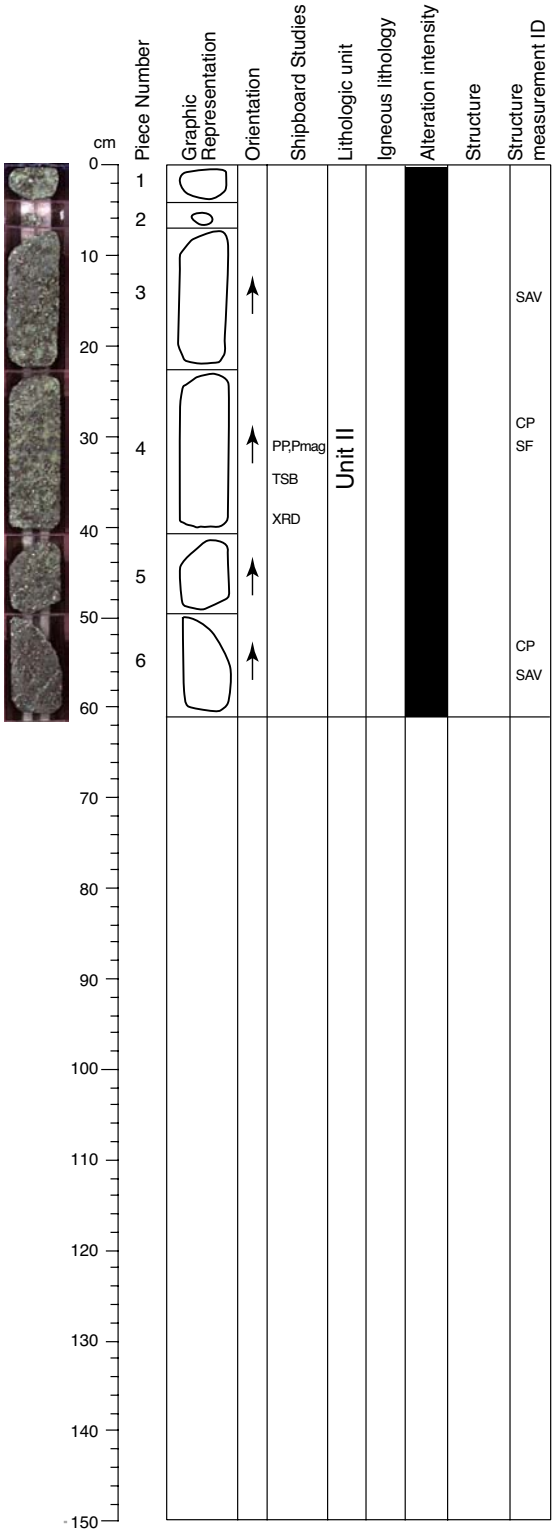
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): >98
This section is composed of completely altered harzburgite with a small, piece of whitish green talc-tremolite schist (Piece 6). Pieces 1-5 and 17-20 are light green, crumbly, and appear strongly clay-altered. Pieces 7-16 are harder, although clay-alteration is still noticeable. Orthopyroxene is replaced by green and white serpentine/clay. Relict mesh-texture is preserved after olivine.

VEINS:
The upper 38 cm of this section contain no visible veins. Pieces 7 to 19 host picrolite and composite picrolite-magnetite veins that were cut by white chrysotile veins. In Pieces 18 and 19, chrysotile–magnetite veins contain as much as 50% magnetite, occurring as coarse-grained crystals within the chrysotile vein matrix.

THIN SECTIONS: Sample 1272A-13R-1, 93-95 cm

STRUCTURE:
The section consists strongly serpentinized harzburgite. Crystal plastic deformation is not strong with some pieces (Pieces 7, 13, and 15) showing a weak foliation inclined a 60 degrees within the cut face of the core. A weak banding is displayed in Piece 15 parallel to the foliation. The texture is protogranular. Pieces 1, 2, 3, 4, and 5 show weak strength cross fiber serpentine foliation aligned subvertically along zones of fewer apparent pyroxene porphyroclasts. Piece 5 is a small pebble of tremolite schist possibly indicating a brittle-ductile fault zone. Piece 7 is densely fractured with many fine fractures filled by white serpentine and incipient brecciation in some locations. Fractures are generally parallel to cross fiber serpentine foliation. Pieces 8 through 16 have weak cross fiber serpentine foliation and a moderate density of fine shear fractures filled with white serpentine that are aligned oblique to cross fiber serpentine foliation. Sparse green serpentine veins visible in Pieces 7 to 16 and 18.

Core Photo



209-1272A-13R-2 (Section top: 62.2 mbsf)

UNIT II: HARZBURGITE

Pieces 1–6

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 73%
Orthopyroxene	Mode 25%
	Size 1–13 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: This section consists of altered harzburgite with protogranular texture. Orthopyroxenes frequently enclose vermicular spinel.

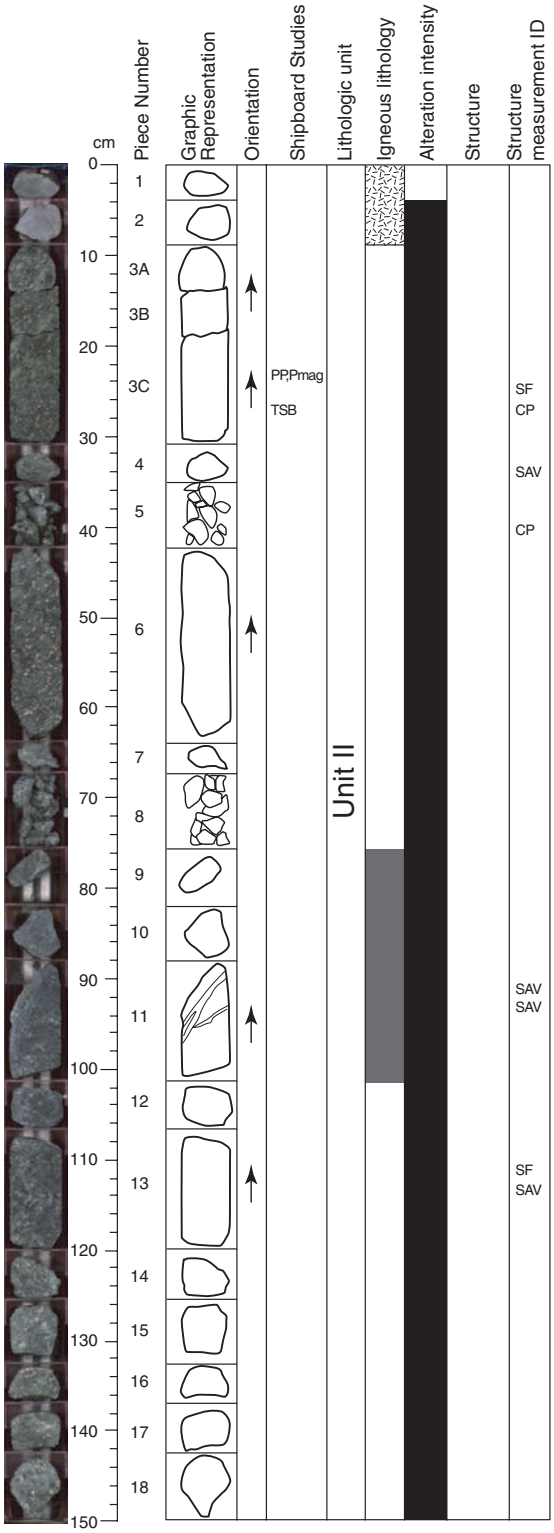
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): >98
This section is a continuation of the light green, crumbly, serpentinized and clay-altered harzburgite described in the previous section.

VEINS:
No veins.

THIN SECTIONS: Sample 1271A-13R-2, 33-36 cm

STRUCTURE:
The section consists of strongly serpentinized harzburgite with protogranular texture. There is some modal variation, but no significant crystal plastic foliation. There are no brittle shear deformation textures in this section. Pieces 1 through 6 have weak intensity cross-fiber serpentine foliation. Piece 3 has a late green serpentine vein. Piece 6 shows crosscutting relations within a late green serpentine vein which is cut orthogonally by small tension cracks filled with white serpentine.

Core Photo



209-1272A-14R-1 (Section top: 65.7 mbsf)

UNIT II: HARZBURGITE

Piece 1–18

COLOR: Gray

PRIMARY MINERALOGY:

Olivine	Mode 74%–96%
Orthopyroxene	Mode 3%–25%
	Size 1–13 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This section has aphyric diabase in Pieces 1-2, altered harzburgite with a protogranular texture in Pieces 3-9, and 11-18, and altered dunite in Pieces 3-18. The aphyric diabase contains many fine vesicles. The contact between harzburgite and dunite is preserved in Piece 9.

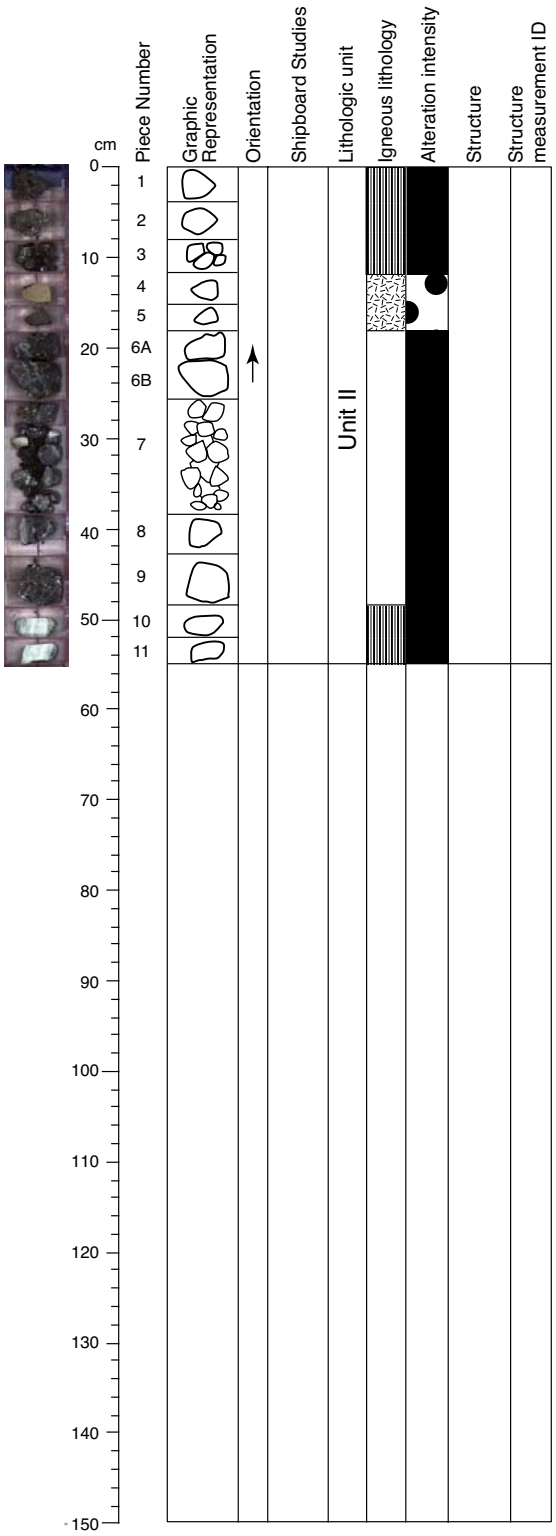
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 1-100
This section begins with two pieces of fresh basalt that probably fell down the hole. The only indication of oxidative alteration in these basalts is a red staining of plagioclase phenocrysts. Pieces 3-8, and 12-18 are completely altered harzburgite with noticeable clay-alteration, a mesh-textured groundmass, and no bastite. Pieces 8-11 have less orthopyroxene, no mesh texture, and abundant bastite after orthopyroxene. Subparallel serpentine veins, ranging from <<1 mm to 1 cm in width, give the rock a foliated appearance. Within the interval from 102 to 150 cm, the intensity of clay alteration increases down the section.

VEINS:
This section hosts early green picrolite and later white wispy chrysotile veins in Pieces 3 to 10 and 12 to 18. Piece 11 contains composite green and black picrolite-magnetite veins that were crosscut by white, wispy, subparallel chrysotile veins. The basalt of Pieces 1 and 2 has no veins.

THIN SECTIONS: Sample 1272A-14R-1, 25-28 cm

STRUCTURE:
The section consists of to fine grained aphyric basalts (Pieces 1 and 2) and strongly serpentinized harzburgite with protogranular texture. There is some modal variation, but no significant crystal plastic foliation with the exception of a weak foliation in Piece 6 that is inclined at 40 degrees in the cut face of the core. There are no brittle shear deformation textures in this section. Pieces 3 through 18 have weak intensity cross-fiber serpentine foliation. Pieces 4 and 7-12 have late green serpentine veins. Piece 11 shows two crosscutting green serpentine veins, which are cut orthogonally by small tension cracks filled with white serpentine.

Core Photo



209-1272A-15R-1 (Section top: 70.0 mbsf)

UNIT II: HARZBURGITE

Pieces 1–9

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 84%
Orthopyroxene	Mode 15%
	Size 1–10 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

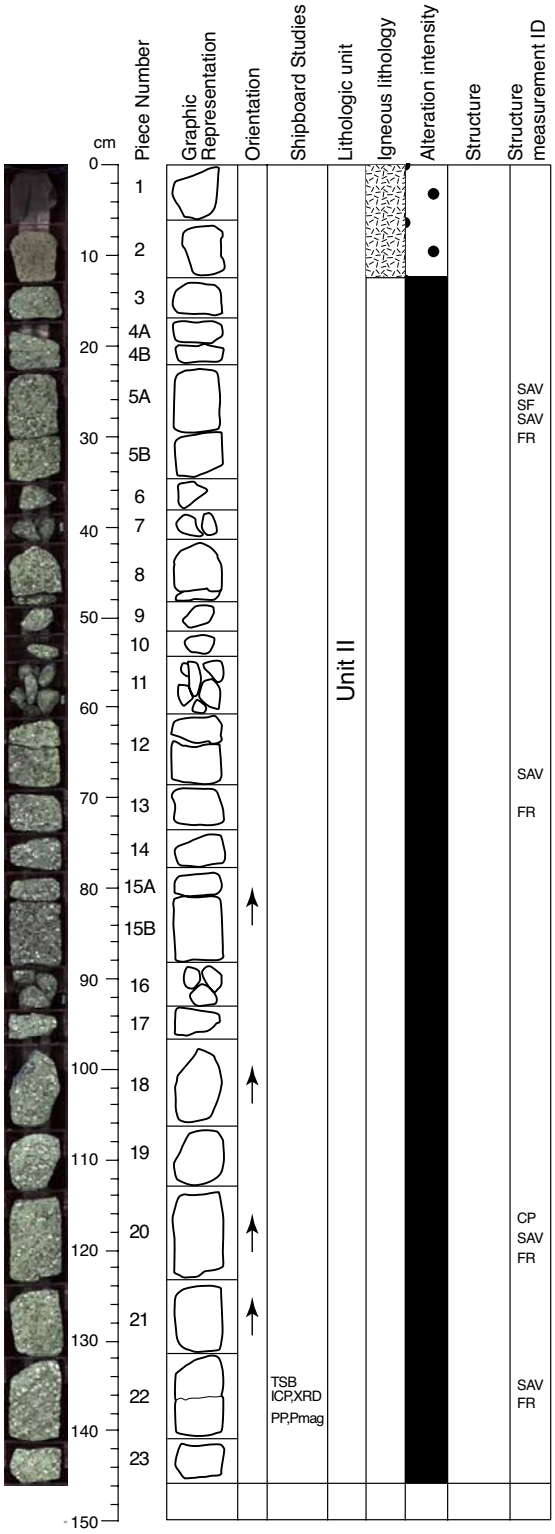
COMMENTS: Pieces 1-3 and 10-11 of this section are completely altered to serpentine preserving no primary textural information. Piece 4 is a microgabbro and Piece 5 is an aphyric diabase. Pieces 6-9 are altered harzburgite with a protogranular texture similar to Core 1272A-14R, but with slightly less orthopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 50-100
The section is composed of basalt and completely altered harzburgite and dunite. Pieces 1 to 3 show green serpentine-clay alteration, while Pieces 6 to 9 have abundant identifiable serpentine (in part as bastite) and magnetite. Basalt and gabbro pebbles in bins 4 and 5 are highly altered.

VEINS:
Vein intensity is low in this core, but where veins are present (Pieces 6, 8, and 9) two different generations of serpentine veins can be identified. The first generation cuts the foliation at a high angle and contains small clusters of chrysotile cross-fibers. The second generation of veins are wispy, sigmoidal veins of chrysotile.

STRUCTURE:
The section consists of a polymict assemblage including serpentinized harzburgite (Pieces 1-3, and 6-7,) diabase (Piece 4), basalt (Pieces 5), gabbro (Pieces 8 and 9) and cross-fibered serpentine vein material (Pieces 10-11). No crystal plastic fabrics were obvious in the small pieces of harzburgites and igneous rocks did not experience crystal-plastic deformation. Pieces 6, 8 and 9 have late green serpentine veins. Piece 9 has white talc vein cutting green serpentine veins. Pieces 10 and 11 are sheared fibrous serpentine veins. Pieces 10 and 11 are intensely deformed tremolite and/or serpentine schist. These pieces were likely deformed by semi-brittle processes at greenschist-grade conditions.

Core Photo



209-1272A-16R-1 (Section top: 75.0 mbsf)

UNIT II: HARZBURGITE

Pieces 1–23

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 74%
Orthopyroxene	Mode 25%
	Size 1–7 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: Piece 1 is an aphyric diabase with 2% small (<2 mm) vesicles and a fresh glassy rim. Piece 2 is a diabase with vesicles. The remainder of the core is altered harzburgite in which the orthopyroxene encloses spinel and small olivine grains.

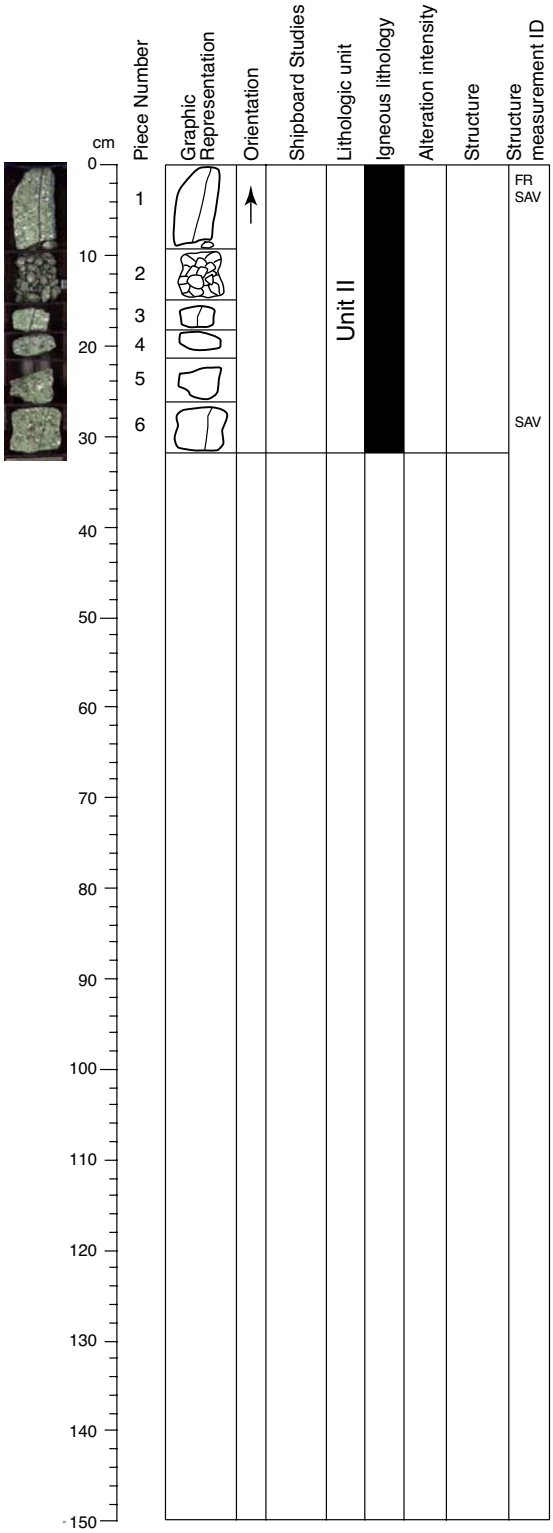
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 50-100
Pieces 1 and 2 are moderately altered basalt/gabbro (clays and iron oxides). The remainder of the section is composed of homogeneous, light green, completely altered harzburgite. There seems to be some low-temperature alteration, forming green clays and giving the rock a soft, somewhat crumbly appearance. Orthopyroxene is mostly replaced by dark green and white serpentine.

VEINS:
Veining is poorly developed in this core. Where present it comprises two generations of serpentine veins. The first generation is dark green serpentine veining cut by a second generation of transgranular sigmoidal chrysotile/picrolite veins. Occasional green chrysotile veins are present as part of the background alteration, but their crosscutting relations are uncertain.

THIN SECTIONS: Sample 1272A-16R-1, 134-136 cm

STRUCTURE:
The section consists of basalt (Piece 1), diabase (Piece 2) and dominantly serpentinized harzburgite with protogranular texture (Pieces 3-27). No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 18 is cut by a highly altered gabbroic or pyroxenitic vein. Pieces 5, 12, 20, 21, and 22 have distinct green serpentine veins, which crosscut the weak remains of a black serpentine network (best shown in pieces 20 and 22). Pieces 3 through 23 all have weak cross fiber serpentine foliation and occasional open fractures. No other significant brittle deformation is present in this section.

Core Photo



209-1272A-16R-2 (Section top: 76.46 mbsf)

UNIT II: HARZBURGITE

Pieces 1–6

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 79%
Orthopyroxene	Mode 20%
	Size 1–10 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

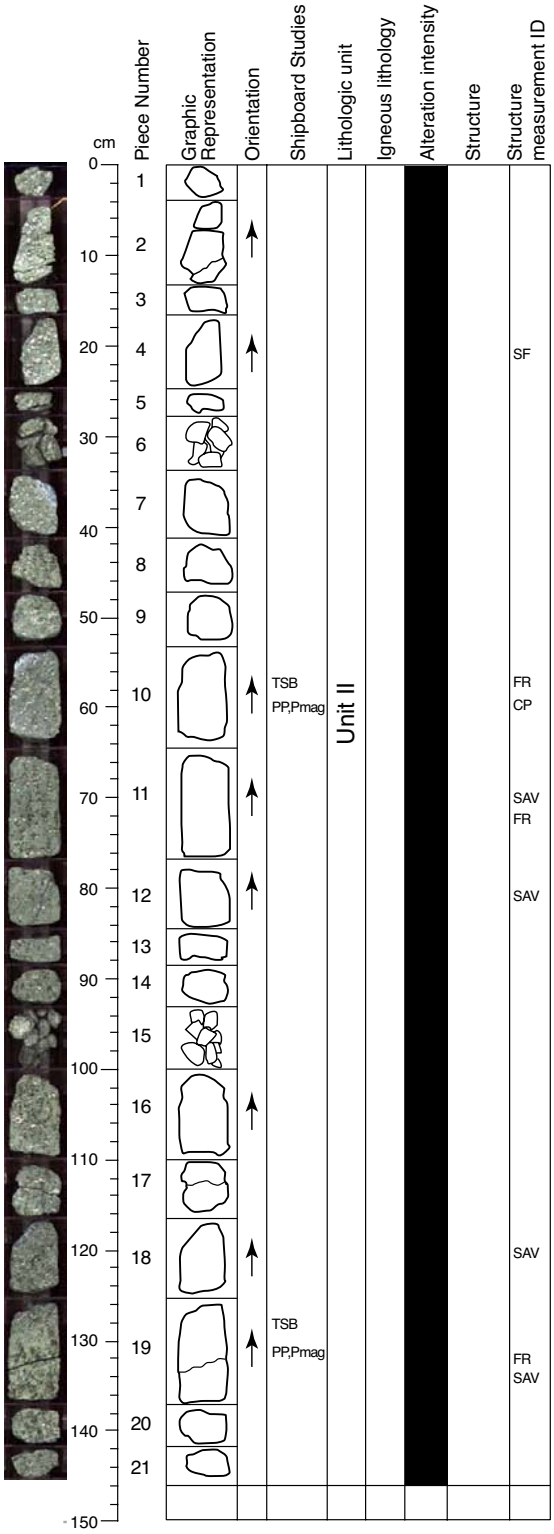
COMMENTS: This section of altered harzburgite contains orthopyroxene that is interstitial and encloses spinel and small olivine grains. It is similar to Section 1271A-16R-1.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
This section is very similar to Section 1271A-16R-1. Orthopyroxene is dominantly replaced by white serpentine and rarely pseudomorphed by bastite.

VEINS:
Veining in this section is dominated by dark green serpentine-magnetite veins (Pieces 1, 3, and 6) with as much as 30% magnetite in the rims. Crosscutting sigmoidal serpentine/chrysotile veins are much less abundant than in Section 1272A-16R-1.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal-plastic foliations were observed within harzburgites in the section. Pieces 1 and 3 are cut by highly altered gabbroic veins that are near vertical and probably part of a single vein. Pieces 1 and 6 are cut by prominent green serpentine veins. The vein in Piece 6 is normally faulted with white serpentine filling the micro-faults.

Core Photo



209-1272A-17R-1 (Section top: 79.6 mbsf)

UNIT II: HARZBURGITE

Pieces 1–21

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 74%–90 %
Orthopyroxene	Mode 10%–25 %
	Size 1–12 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This section of altered harzburgite contains orthopyroxene that is interstitial and encloses spinel and small olivine grains. It is similar to Section 1271A-16R-2.

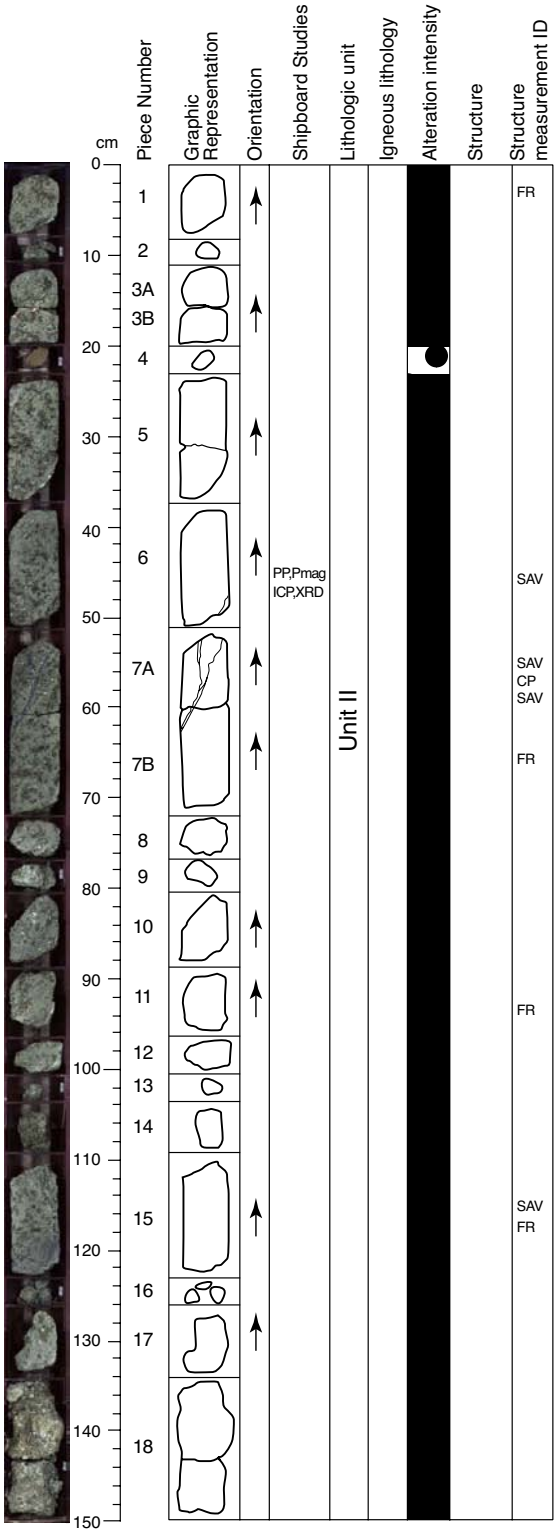
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
This section is remarkably homogeneous and composed of harzburgite completely altered to serpentine and clays. Orthopyroxenes are replaced by serpentine. Some bastite cores after orthopyroxene are present at the top of the section.

VEINS:
Throughout this section, veining is infrequent and volumetrically not significant (<1%). In Pieces 12, 13, and 18 a single serpentine vein associated with clusters of chrysotile cross-fibers is developed. Elsewhere, tiny sigmoidal chrysotile veins crosscut fabrics of the background alteration (Piece 18) or are subparallel to the background alteration and contain high percentages of magnetite (Piece 1).

THIN SECTIONS: Samples 1272A-17R-1, 56-58 cm and 1272A-17R-1, 127-129 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 10 and 11 contain subtle modal banding. Piece 18 is cut by a highly altered gabbroic vein. Pieces 3, 6, 7, 11-13, 18, and 19 have prominent green serpentine veins. Most pieces exhibit small, subhorizontal talc filled veins orthogonally cutting the serpentine veins. Pieces 1 through 21 have occasional open fractures and a weak cross fiber serpentine foliation.

Core Photo



209-1272A-18R-1 (Section top: 84.6 mbsf)

UNIT II: HARZBURGITE

Pieces 1–18

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 74%
Orthopyroxene	Mode 25%
	Size 1–12 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This core contains mostly altered harzburgite with orthopyroxene that is interstitial and encloses spinel and small olivine grains. It is similar to Section 1271A-17R-1. Piece 4 is a microgabbro.

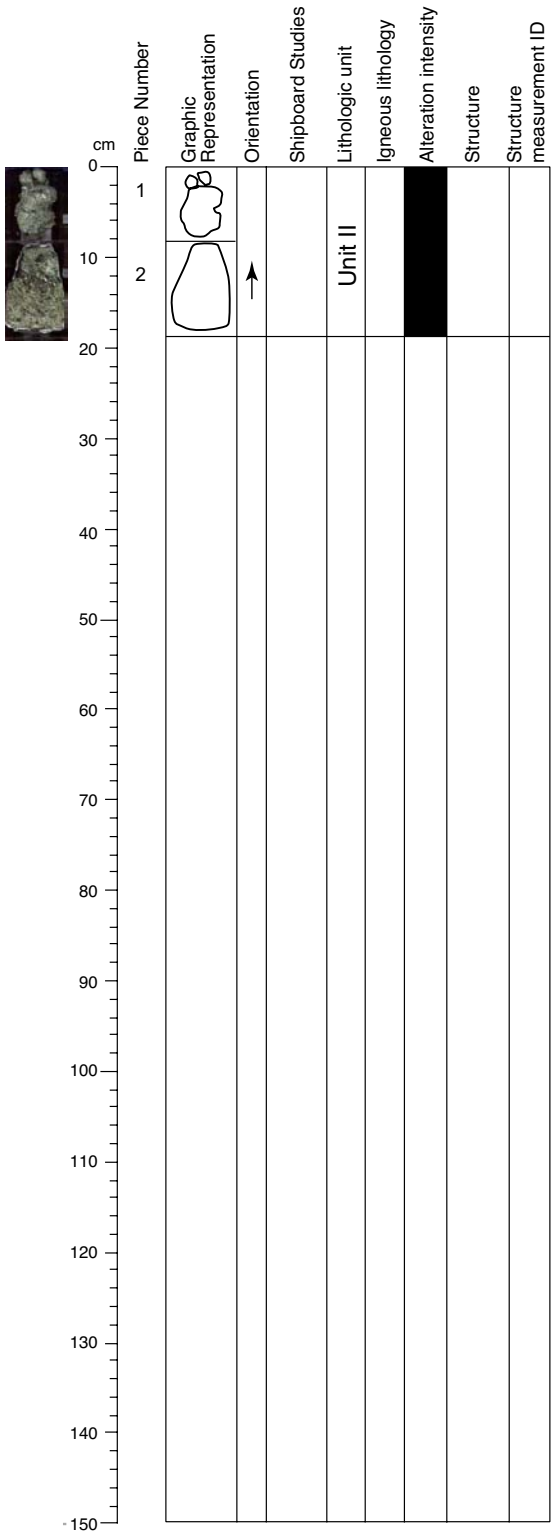
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 70- 99
Most of the section is composed of completely altered harzburgite with a light green color possibly due to the presence of clay. Clays appear to replace serpentine mesh textures and have a white color in mesh centers. Orthopyroxenes are altered to serpentine (some as bastite). The bottom piece of the section is soft and appears to be somewhat compacted clay after harzburgite. Piece 4 is a bin with small pebbles of highly altered microgabbro.

VEINS:
Pieces 7 and 15 have 5-mm-wide serpentine veins as long as 15 cm. Elsewhere in the section, these veins are much less pronounced. Large serpentine veins are associated with, and crosscut by, sigmoidal en echelon arrays of small serpentine veins.

THIN SECTIONS: Sample 1272A-18R-1, 46-49 cm

STRUCTURE:
The section consists dominantly of highly altered serpentinized harzburgite with protogranular texture (Pieces 1-3, and 5-18) and one diabase (Piece 4). No obvious crystal-plastic foliations were observed within harzburgites in the section. Pieces 6, 7, and 15 are cut by a highly altered veins that are curved and generally inclined between 70 and 90 degrees. Whether these are simply serpentine alteration veins or had precursor magmatic veins is not clear because of the extensive alteration of the section. Pieces 3, 6, 7, 10, 11, and 14 have prominent green serpentine veins. Most exhibit small, subhorizontal talc filled veins orthogonally cutting the serpentine veins. Pieces 7A and 7B have a large branching green serpentine vein. Pieces 7 through 17 exhibit minor open fractures with consistent orientations. Pieces 15 through 17 also have weak to moderate strength cross-fiber serpentine foliation. Piece 18 is a partially cohesive, serpentine- and/or clay-rich breccia. The breccia is composed of a very fine, green matrix containing few lithic clasts and numerous mica flakes. The breccia is likely of tectonic origin. Pieces 16 consists of small pebble-sized pieces of harzburgite that may have been clasts within the breccia judging by the matrix clay similar to that of Piece 18 on their surfaces.

Core Photo



209-1272A-18R-2 (Section top: 86.1 mbsf)

UNIT II: HARZBURGITE

Piece 1–2

COLOR: Dark green

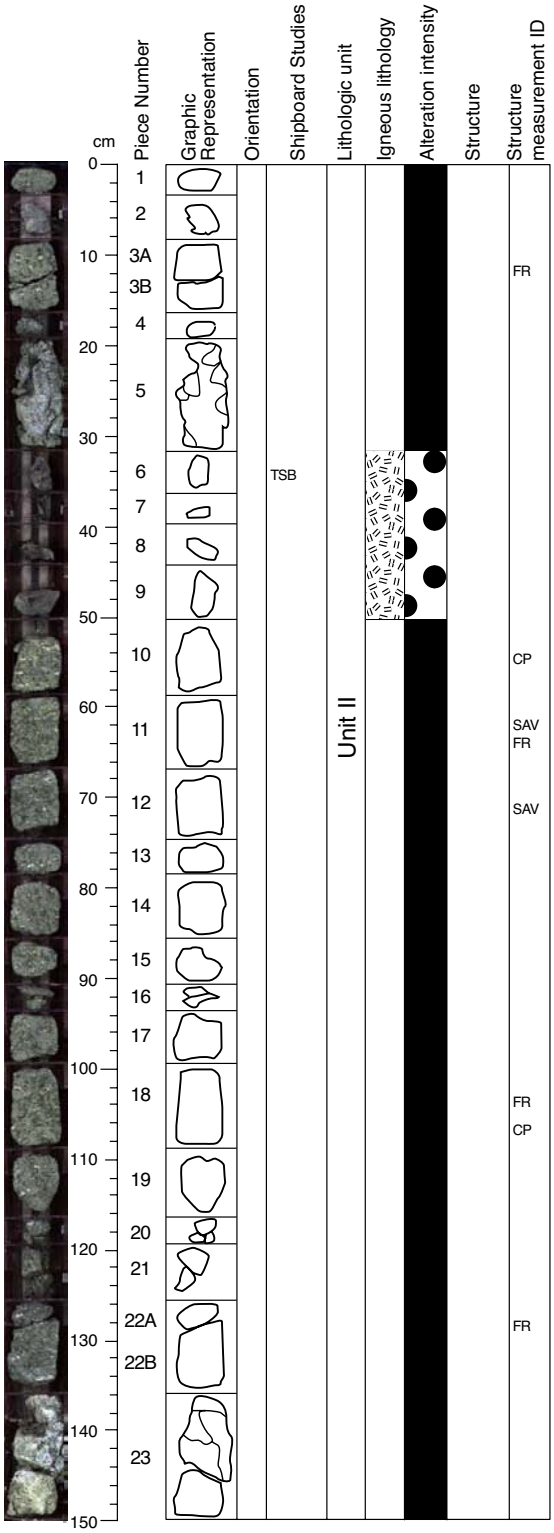
PRIMARY MINERALOGY:
None preserved.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 100
This section is composed of two bins of consolidated green mud possibly formed by clay alteration of harzburgite.

VEINS:
No veins.

STRUCTURE:
Piece 1 is a partially cohesive, serpentine- and/or clay-rich breccia. The breccia is composed of a very fine, green matrix containing few lithic clasts and numerous micaceous-appearing flakes. The breccia is likely of tectonic origin. Piece 2 is a partially cohesive, serpentinite-derived breccia. Lithic clasts of serpentinite and altered pyroxene crystals are contained within a fine-grained serpentine-rich matrix. Elements of former serpentinite textures are visible through brecciation and indicate a lower degree of deformation and alteration than Piece 1. Both breccias in this section are thought to be tectonic in origin.

Core Photo



209-1272A-19R-1 (Section top: 89.3 mbsf)

UNIT II: HARZBURGITE

Pieces 1–5, 10–23

COLOR: Light to dark green

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 75%–80 %
Orthopyroxene	Mode 15%–20 %
	Size 1–12 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This core contains mostly altered harzburgite with orthopyroxene that is interstitial and encloses spinel and small olivine grains. Piece 2 is highly altered and brecciated.

Piece 6–9

COLOR: Brown

PRIMARY MINERALOGY: OXIDE GABBRONORITE

Clinopyroxene	Mode 30%
	Size <15 mm
	Shape/Habit Euhedral
Oorthopyroxene	Mode 20%
	Size <10 mm
	Shape/Habit Euhedral
Plagioclase	Mode 45%
	Size <8 mm
	Shape/Habit Euhedral
Oxide	Mode 5%
	Size <10 mm
	Shape/Habit Interstitial

COMMENTS: Pieces 6-9 are a coarse-grained oxide gabbronorite. The oxide is very heterogeneously distributed.

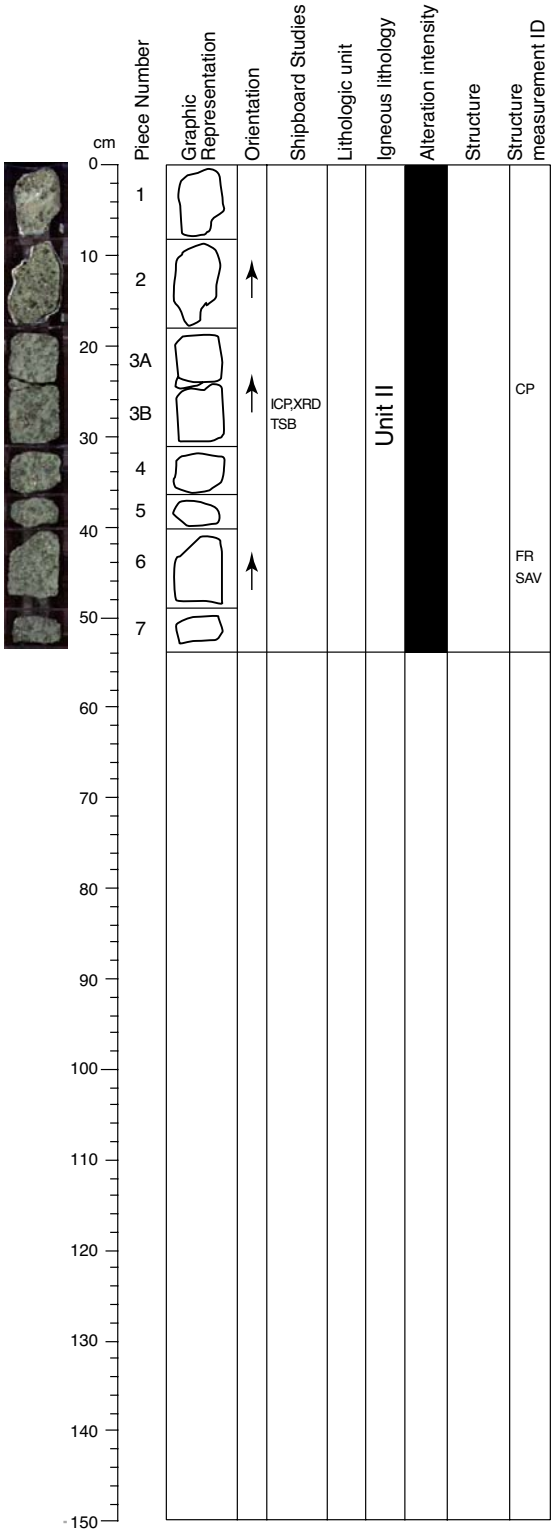
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 60-99
The section is mostly composed of completely altered harzburgite very similar to the previous sections. Pieces 6 to 9 are highly altered (60%) oxide gabbro with amphibole and chlorite after plagioclase and pyroxene and secondary oxides after FeTi-oxides. Pieces 2 and 5 are mud.

VEINS:
The only significant veining in this section are dark green serpentine veins in Pieces 1, 11, and 12. Elsewhere in the section, this type of veining is poorly developed and accompanied by small amounts of wispy sigmoidal chrysotile veining that crosscuts the earlier generation.

THIN SECTIONS: Sample 1272A-19R-1, 33-35

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture (Pieces 1-4, and 10-22), oxide gabbro to oxide pyroxenite (Pieces 6-10) and partially cohesive serpentinite derived breccias (Pieces 2, 5, and 23). No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 1, 10-15, and 18-22 have green serpentine veins. Most exhibit small, subhorizontal talc filled veins orthogonally cutting the serpentine veins. This section has experienced significant brittle deformation. Pieces 2 and 5 are partially cohesive, serpentinite-derived breccias. Lithic clasts of serpentinite and altered pyroxene crystals are contained within a fine-grained serpentine-rich matrix. Pieces 10 through 22 are cut by arrays of fine, parallel oriented fractures. Fractures do not seem to offset pyroxene porphyroclasts, and may be concentrated in the serpentine matrix. Fractures define a weak foliation within these samples, and several sets of open fractures are aligned parallel to them. Piece 23 is a fine-grained, partially cohesive serpentine breccia. Fine (< 0.5 cm) lithic clasts are randomly oriented in a green, extremely fine-grained matrix. Breccias in this section are presumed to be of tectonic origin. Piece 7 shows green serpentine with slickensides on the surface of a pebble of oxide gabbro. The sections were likely cut by one or more fault zones based on the recovery of tectonic breccias at two levels in the section.

Core Photo



209-1272A-19R-2 (Section top: 90.8 mbsf)

UNIT II: HARZBURGITE

Pieces 1–7

COLOR: Green to light green

PRIMARY MINERALOGY:

Olivine	Mode 79%
Orthopyroxene	Mode 20%
	Size 1–12 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: Pieces 1-2 are highly altered and brecciated. Pieces 3-7 are altered harzburgite with orthopyroxene that is interstitial and encloses spinel and small olivine grains.

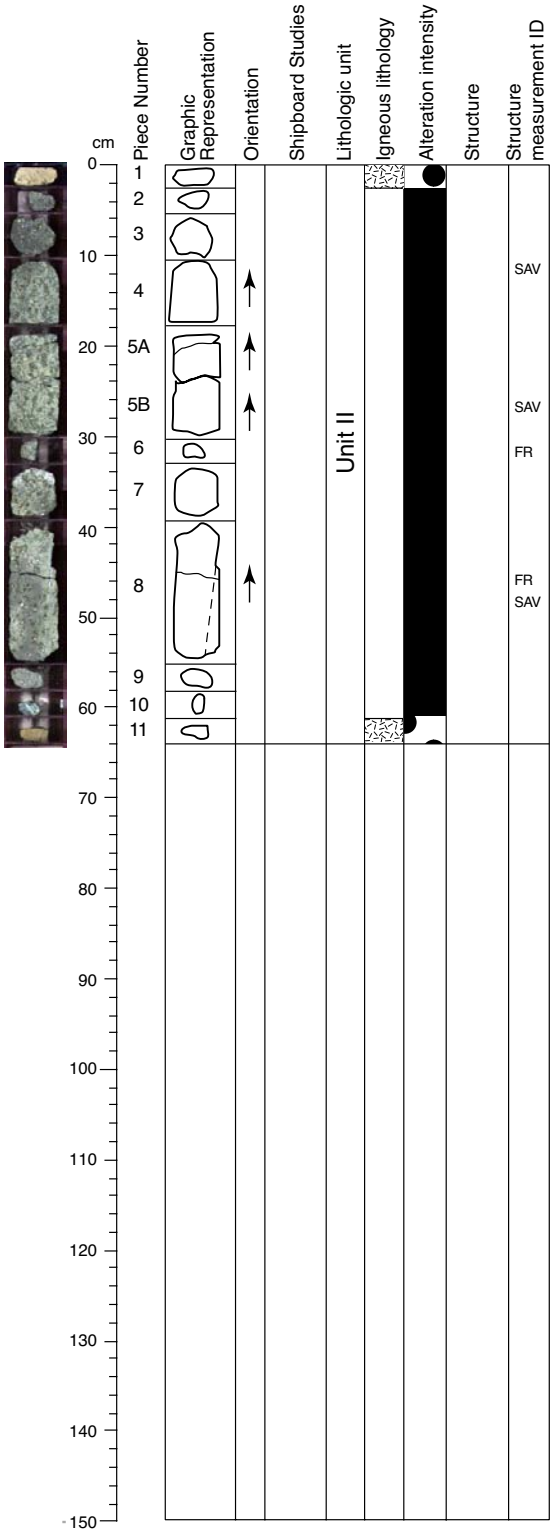
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 60-99
Pieces 1 and 2 are consolidated mud after green clay altered harzburgite. The rest of the section is completely altered light green harzburgite (serpentine and clay alteration). The overprint of clay alteration is severe and most centers of the mesh texture are leached, giving the rock a porous appearance. Orthopyroxenes are altered to bastite overprinted by coronas of light to dark green serpentine.

VEINS:
No veins.

THIN SECTIONS: Sample 1272A-19R-2, 27-29 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 1 and 2 contain highly concentrated shear fractures and zones of incipient brecciation. Fractures define a faint foliation in some locations. These pieces have been disturbed by drilling, so the true nature of structures is difficult to determine, but they appear to be the loci of intense brittle or cataclastic deformation at the top of the section. This is consistent with relationships at the base of Section 1272A-19R-1. Pieces 3 through 7 contain occasional open fractures.

Core Photo



209-1272A-20R-1 (Section top: 94.3 mbsf)

UNIT II: HARZBURGITE

Pieces 1–11

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 84%–90%
Orthopyroxene	Mode 10%–15%
	Size 1–10 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

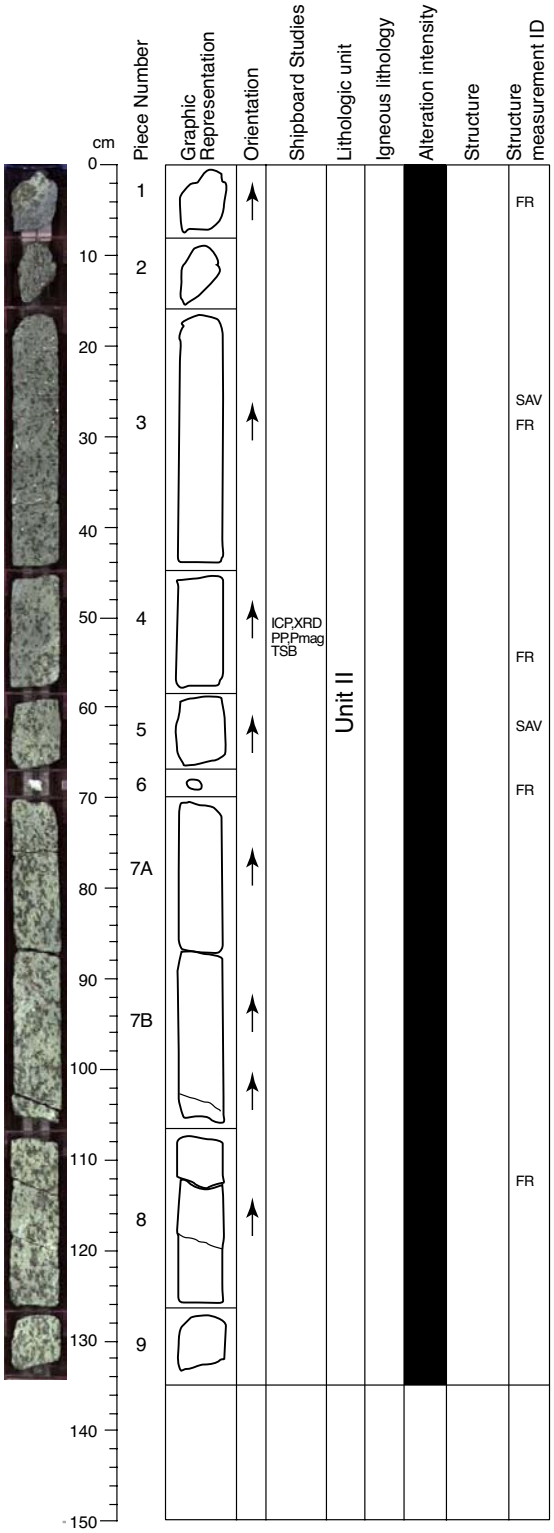
COMMENTS: Pieces 1 and 11 are aphyric diabase and the remainder of this core is altered harzburgite with protogranular texture. It is similar to the harzburgite in previous cores but has slightly less orthopyroxene.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 70-99
Except for the microgabbro pebbles the background alteration is homogeneous. The section is mostly composed of completely altered harzburgite very similar to the previous sections. Clay alteration is strong and orthopyroxene is altered to bastite and coronas of non-pseudomorphic serpentine. Spinel seems to be fresh.

VEINS:
This section hosts early green picrolite and later white wispy chrysotile veins in Pieces 3 to 8. The microgabbro of Pieces 1 and 19 has no veins.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture (Pieces 2-9) and diabase (Piece 1 and 11). No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 3, 4, 5, and 8 have prominent green serpentine veins. Most exhibit small, subhorizontal talc filled veins orthogonally cutting the serpentine veins. Piece 8 shows a composite green serpentine vein. Piece 10 is a small piece of a ductilely deformed vein material with schistose foliation. Pieces 2 through 9 contain arrays of parallel fine shear fractures that in places define a weak but consistent foliation. These fractures are parallel to open fractures spaced an average of 10 cm from one another.

Core Photo



209-1272A-21R-1 (Section top: 98.9 mbsf)

UNIT II: HARZBURGITE

Pieces 1–9

COLOR: Light green

PRIMARY MINERALOGY:

Olivine	Mode 755–80%
Orthopyroxene	Mode 20%–25%
	Size 1–15 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: This section is composed of altered harzburgite with a protogranular texture. It is similar to that noted in the cores above this section.

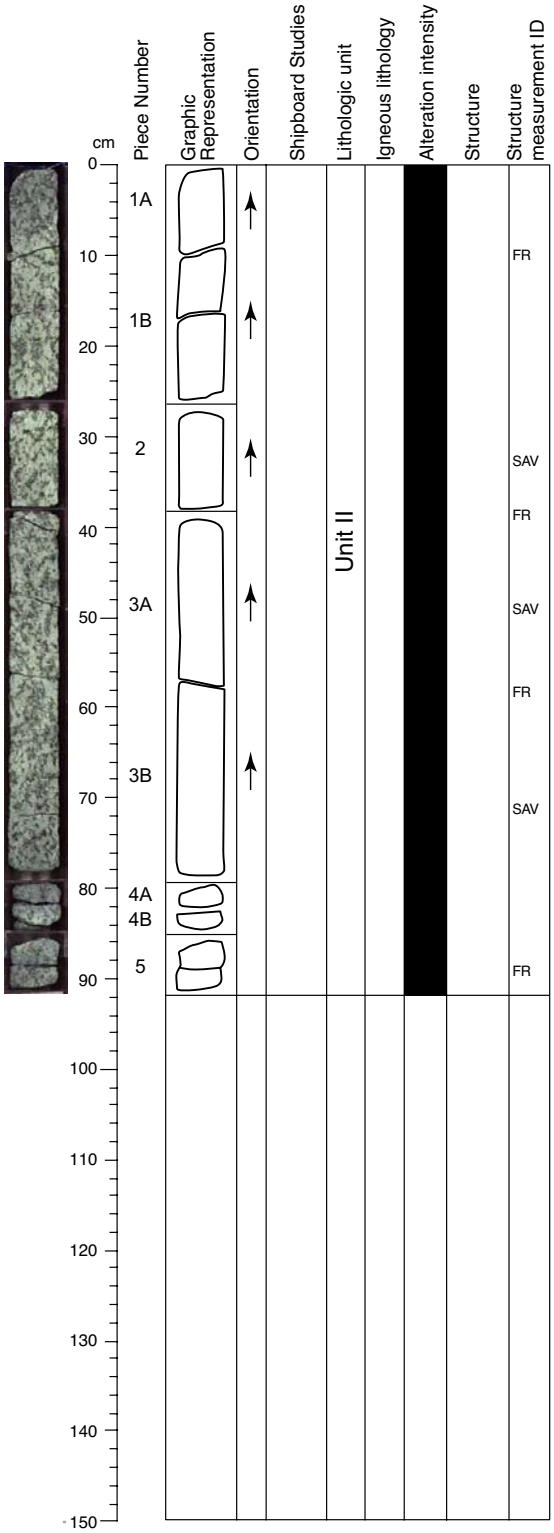
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
This section contains completely altered harzburgite very similar to the previous sections (e.g., Section 1272A-20R-1)

VEINS:
Veining is not significant in this section. Where present it resembles the better developed veins in Sections 1272A-14R-1 to 18R-1.

THIN SECTIONS: Sample 1272A-21R-1, 50-53 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with coarse protogranular texture (Pieces 1-5 and 7-9) and one pebble of soapstone (Piece 6). No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 3, 5, and 6 have prominent green serpentine veins. Most exhibit small, subhorizontal talc filled veins orthogonally cutting the serpentine veins. Piece 3 has small subhorizontal talc veins. Pieces 2 through 8 contain regularly spaced open fractures with a consistent orientation. A serpentine foliation is inclined at 40 degrees in the cut face of the core. Fractures are spaced between 5 and 30 cm from one another. The soapstone (Piece 6) may correlate with a major inclined fault zone based on FMS logging images at this depth and explain low recovery across the interval.

Core Photo



209-1272A-21R-2 (Section top: 100.25 mbsf)

UNIT II: HARZBURGITE

Pieces 1–7

COLOR: Light green

PRIMARY MINERALOGY: HARZBURGITE

Olivine	Mode 79%
Orthopyroxene	Mode 20%
	Size 1–15 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

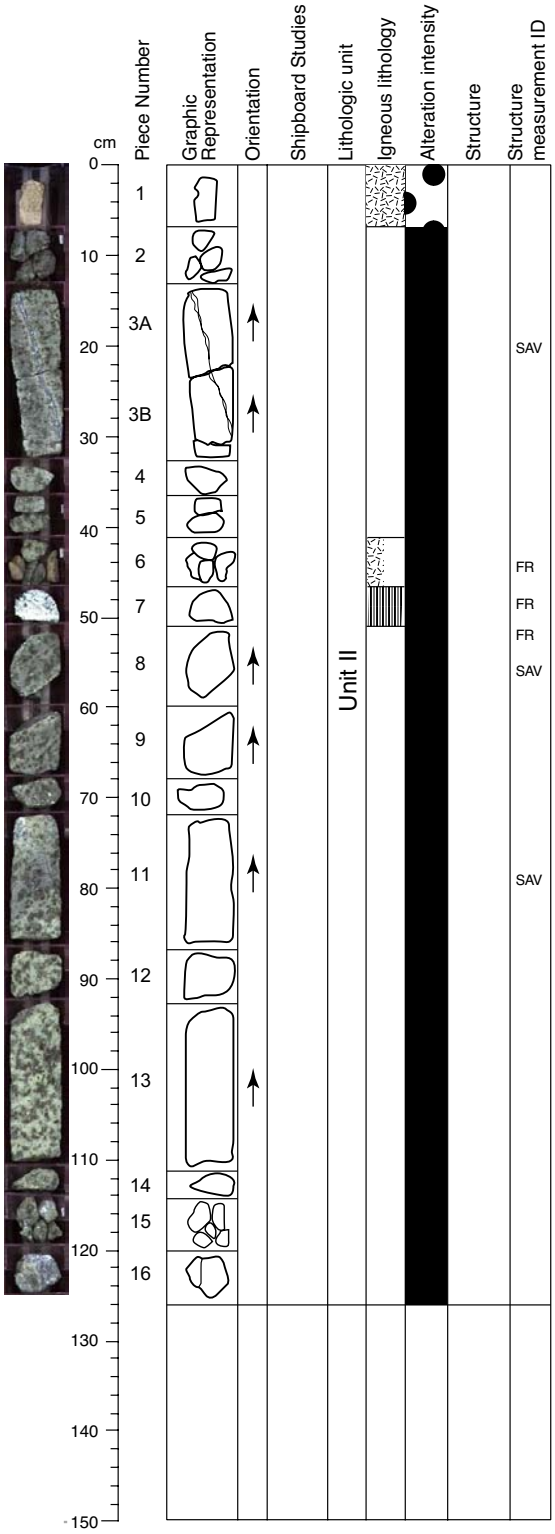
COMMENTS: Pieces 1-5 are altered harzburgite with protogranular texture. Piece 6 consists of several small pebbles of microgabbro and serpentinite. Piece 7 is a highly altered serpentinite.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
The section is mostly composed of completely altered harzburgite very similar to the previous sections.

VEINS:
Veining comprises the same two generations of veins present throughout Sections 1272A-14R-1 to 21R-1.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with a coarse protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 1 and 3 are cut by highly altered gabbroic veins that are near vertical. Piece 2 is cut by prominent green serpentine veins. Pieces 1 through 5 contain regularly spaced open fractures with a consistent orientation. Fractures are spaced between 5 and 30 cm from one another.

Core Photo



209-1272A-22R-1 (Section top: 103.9 mbsf)

UNIT II: HARZBURGITE

Pieces 1–16

COLOR: Light green to green

PRIMARY MINERALOGY:

Olivine	Mode 84%
Orthopyroxene	Mode 25%
	Size 1–15 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

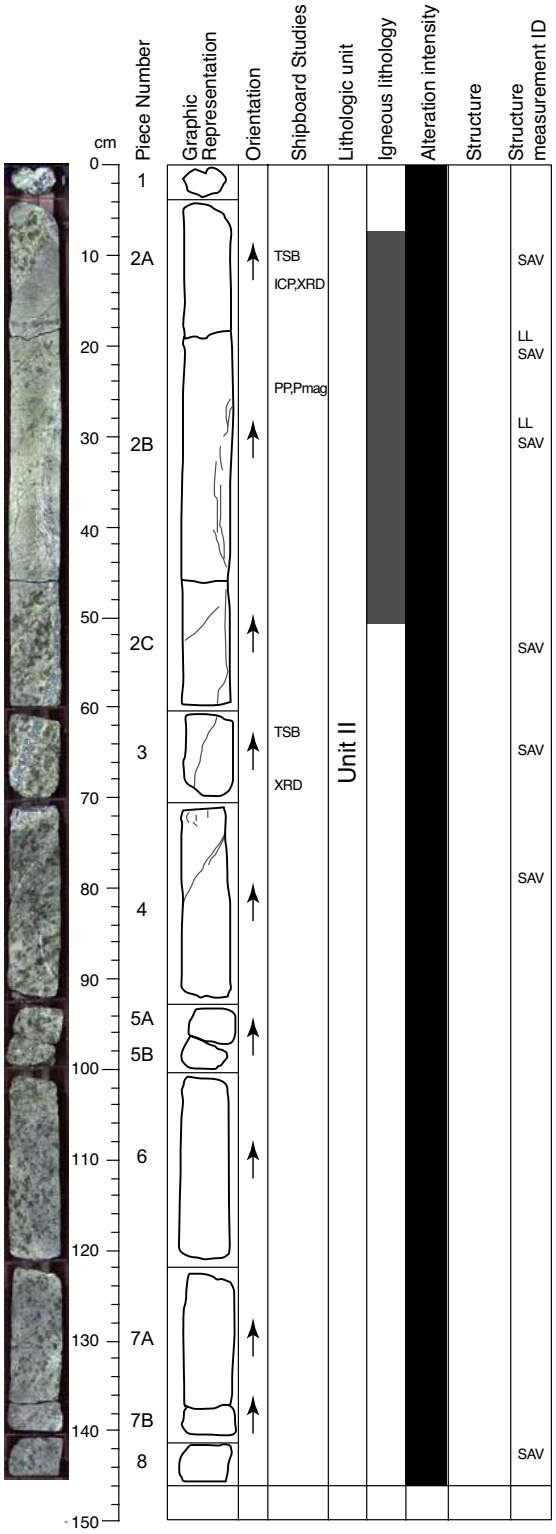
COMMENTS: Pieces 1 and 6 of this section are aphyric diabase. Piece 6 consists of several small pebbles of microgabbro and serpentinite. Piece 7 is highly altered serpentinite. The rest of the core is altered harzburgite with a protogranular texture and is similar to the previous cores.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 99
The section is mostly composed of completely altered harzburgite. Pieces of basalt that are highly altered to clay and Fe-oxyhydroxide are also present in the section (Pieces 1 and 6). The harzburgite is mainly altered to serpentine and green clays. Olivine is altered to serpentine mesh texture that locally shows later transformation of the cores to clays. Orthopyroxenes are transformed to bastite, with some relics of fresh orthopyroxenes in the centers and green serpentine coronas. Spinel seems to be fresh in most pieces.

VEINS:
Fine, white, wispy serpentine veins are weakly developed. These may be paragranular or transgranular cutting across individual orthopyroxene crystals. Pieces 3, 7, 11, and 16 certain discrete, straight to irregular, transgranular, light green picrolite veins that are crosscut by some of the fine wispy chrysotile veins.

STRUCTURE:
No obvious crystal-plastic foliations were observed within harzburgites throughout most of the section, except for a weak pyroxene aggregate foliation in Pieces 8 and 9 that is inclined 35 degrees in the cut face of the core. Pieces 1, 2, 3, and 6 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal talc-filled veins orthogonally cutting the serpentine veins. Talc veins are also visible in Pieces 3 and 11. Piece 7 shows crosscutting relationships between serpentine and talc veins. Piece 16 ends in a network of serpentine veins crosscut by talc. There is little brittle deformation in this section. Pieces 2 through 6 are cut by many fine fractures aligned parallel to weak cross-fiber serpentine foliation. Several open fractures are present throughout the core section.

Core Photo



209-1272A-23R-1 (Section top: 108.5 mbsf)

UNIT II: HARZBURGITE

Pieces 1-8

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 73%–88 %
Orthopyroxene	Mode 15%–25 %
	Size 2–17 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: Piece 1 is an aphyric diabase and Piece 2 is mostly an altered dunite with orthopyroxene concentrated in layers from 10% to 40%. The remainder of the core is altered harzburgite with protogranular texture. Pieces 7 and 8 have more spinel than the rest of the core (as much as 3.5%).

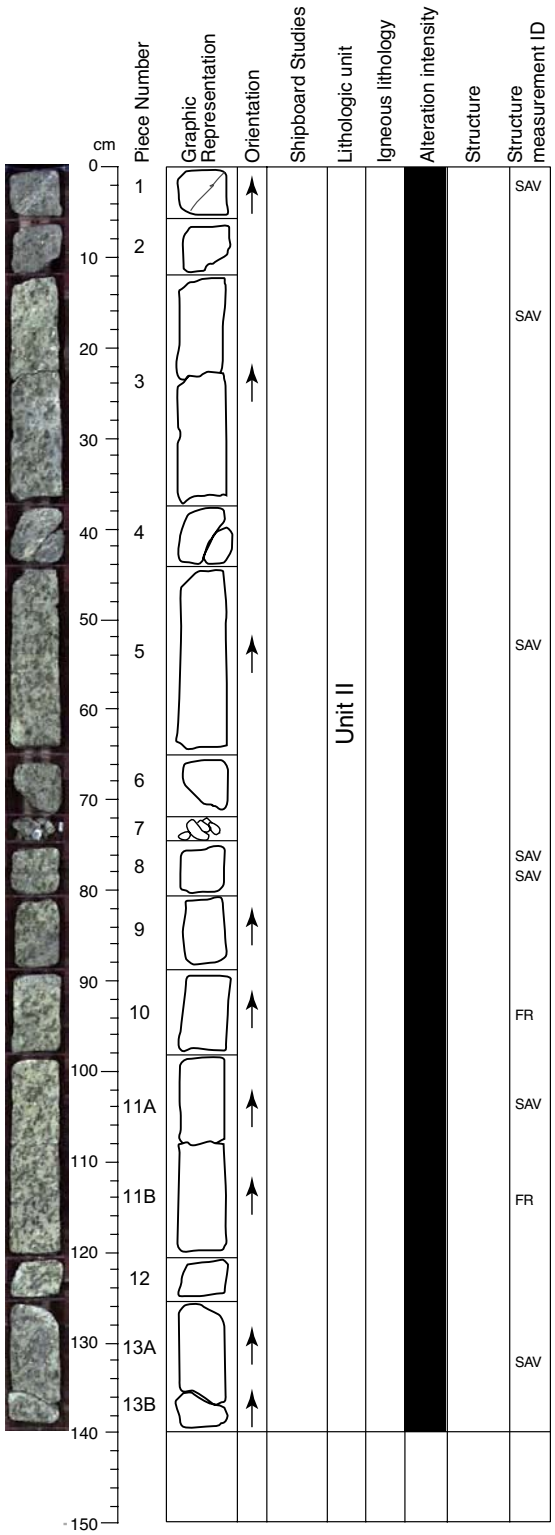
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98
Except for bin 1, which contains basalt and peridotite rubble, the section is composed of completely altered green dunite and harzburgite. The background alteration is similar in harzburgite (Pieces 2C to 8A) and dunite (Pieces 2A and 2B). Olivine is altered mostly to green serpentine and clay. Rare fresh olivine may occur in patches. Orthopyroxene is mostly altered to serpentine (bastite with green serpentine mantles) with rare relict orthopyroxene preserved in the centers.

VEINS:
Wispy, white transgranular (to locally paragranular) veinlets are present in all pieces. These veinlets crosscut black serpentine-magnetite veins, which are irregularly branched. 0.5 mm wide, massive, dark green serpentine veins with abundant cross-fractures are dominant in Pieces 2 and 3 and are crosscut by the other two types of veins.

THIN SECTIONS: Sample 1272A-23R-1, 7-11 cm and 1272A-23R-1, 2-64 cm

STRUCTURE:
Piece 1 is two pebble-sized fragments, one of harzburgite and the other diabase. Piece 2 contains a dunite layer bounded sharply at 12 cm by an upper harzburgite contact and at 40 cm by a lower harzburgite contact. The layer is inclined at 50 degrees in the cut face of the core and is approximately 28 cm thick. No obvious crystal plastic foliations were observed within harzburgite pieces in the section. Pieces 2 and 3 are cut by a possible magmatic vein that is near vertical and riddled with longitudinal serpentine veins. The vein, which looks continuous across the pieces, is so highly altered that the original protolith cannot be recognized. Oxides are concentrated along the altered zone. Pieces 1-5 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Talc veins are also visible in Pieces 7 and 8. Pieces 2 and 4 show crosscutting relationships between serpentine veins. Piece 2 is cut by numerous thin (0.5-mm) planer serpentine veins cut by a later subvertical 40 cm long green serpentine veins. Piece 4 contains 2-cm-wide zone serpentine schist with strong foliation suggesting greenschist-facies deformation. Piece 1 exhibits serpentine slickenfibers.

Core Photo



209-1272A-23R-2 (Section top: 109.96 mbsf)

UNIT II: HARZBURGITE

Pieces 1–13

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 63%–88 %
Orthopyroxene	Mode 10%–35 %
	Size 5–17 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

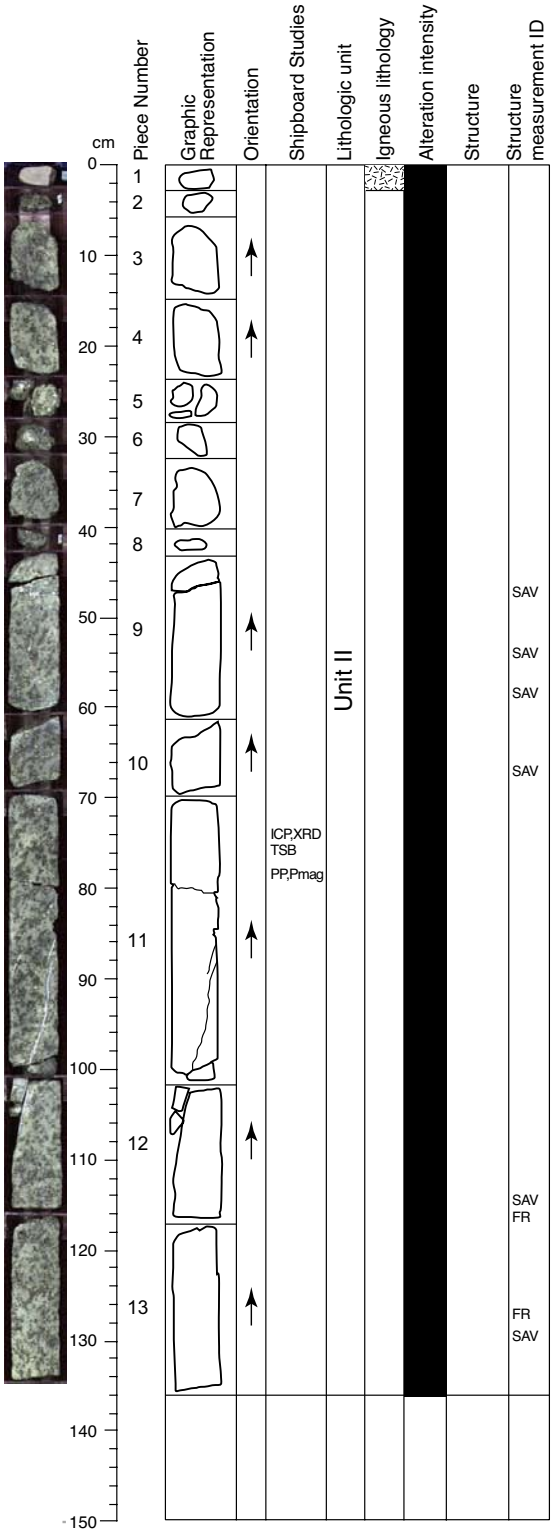
COMMENTS: Altered harzburgite with protogranular texture similar to harzburgite in previous cores.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98
The section is composed of completely altered harzburgites. The metamorphic mineral assemblage consists mainly of serpentine and clays. Olivine is completely altered to serpentine, and shows a relict mesh texture where the mesh centers appear partly replaced by clay. Orthopyroxenes are replaced by bastite and green serpentine mantles with rare relict orthopyroxene preserved in the centers. Spinel seems to be fresh in most pieces.

VEINS:
Minor wispy, white, transgranular veinlets are present in all pieces. These typically contain cross-fiber chrysotile. Massive single serpentine (±magnetite) veins with prominent cross-fractures are present in Pieces 1, 3, 8, and 11B. These are crosscut by the wispy veinlets.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with a coarse protogranular texture. No obvious crystal- plastic foliations were observed within harzburgites in the section. Pieces 1, 3, 5, 8, 11, and 13 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Pieces 3 and 8 show crosscutting relationships between serpentine veins. Pieces 1 through 12 contain occasional open fractures; spacing between fractures is <10 cm. Piece 13 contains a serpentine foliation inclined 30 degrees in the cut face of the core.

Core Photo



209-1272A-24R-1 (Section top: 113.5 mbsf)

UNIT II: HARZBURGITE

Pieces 1–13

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 75%–80 %
Orthopyroxene	Mode 20%–25 %
	Size 5–12 mm
	Shape/Habit Anhedral
Spinel	Mode 1%

COMMENTS: Piece 1 of this section is a microgabbro. The remainder of the core is composed of altered harzburgite with protogranular texture. It is similar to the altered harzburgite in previous cores.

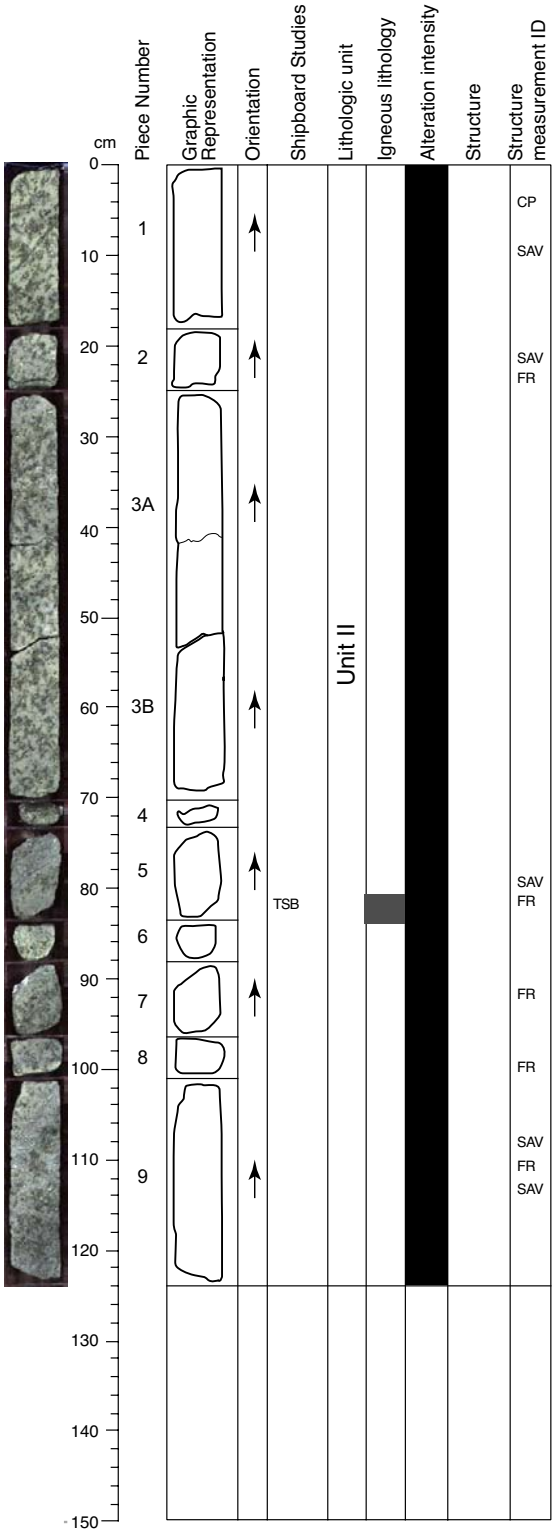
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 98
The section is composed of completely altered, soft, green harzburgite, which shows clay alteration overprinting an earlier stage of serpentinization. The olivine is altered to a serpentine mesh textured matrix with iron oxides in the mesh centers. In some pieces the clay alteration shows a patchy occurrence. Orthopyroxenes are replaced by bastite and green serpentine mantles with rare relict orthopyroxene preserved in the centers. Spinel seems to be fresh in most pieces.

VEINS:
Minor, white, wispy serpentine veining is developed in pieces of altered harzburgite in this section. A prominent, straight, transgranular serpentine vein with a 3-mm wide light gray halo is present in Pieces 11B and continues in Piece 12. This vein crosscuts the white wispy veinlets.

THIN SECTIONS: Sample 1272A-24R-1, 74-76 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with a coarse protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 9 is cut by a thin pyroxenite stringer. Pieces 9 to 13 are cut by prominent green serpentine veins. Piece 11B exhibits small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 9 has small talc veins overprinting the green serpentine veins. There is little brittle deformation in this section. Pieces 2 through 13 have several open fractures spaced between 5 and 10 cm from one another.

Core Photo



209-1272A-24R-2 (Section top: 114.86 mbsf)

UNIT II: HARZBURGITE

Pieces 1–9

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 72%–97 %
Orthopyroxene	Mode 3%–20 %
	Size 5–10 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: This core contains altered harzburgite with protogranular texture same as harzburgite in previous cores. Pieces 5 to 9 contain a greater amount of spinel and have alternating patches of harzburgite and dunite.

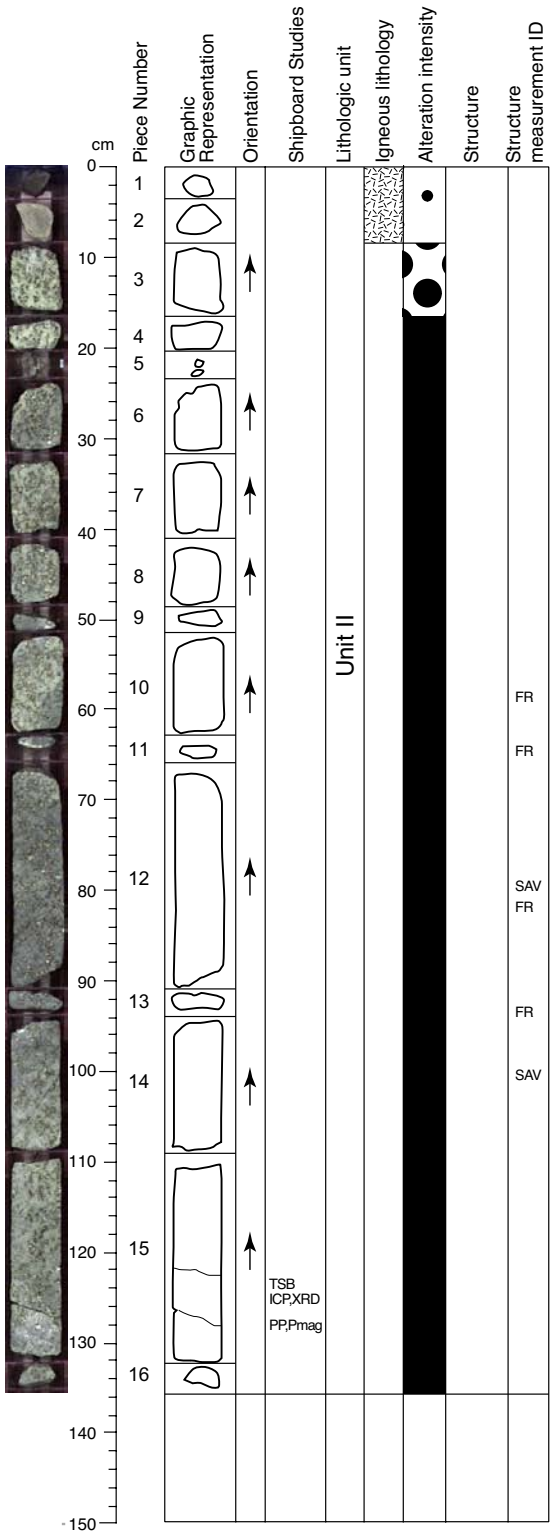
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely altered, green harzburgite that shows a strong overprint of clay alteration. Olivine is altered to mesh textured serpentine with rare fresh olivine in mesh centers. The alteration is patchy gray green in some pieces. Orthopyroxene is partly altered to serpentine with a thin corona of green serpentine. Fresh orthopyroxene is commonly preserved in the centers. Spinel seems to be fresh in most pieces.

VEINS:
This section contains minor wispy, paragranular serpentine veins. Pieces 1, 2, 5, 6, and 9 contain straight, dark green transgranular serpentine veins with abundant cross-fractures. These are locally crosscut by the paragranular serpentine veins.

THIN SECTIONS: Sample 1272A-24R-2, 81-83 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 1, 2, 5, 7, and 9 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 9 shows crosscutting relationships between these late serpentine or talc veins and earliest serpentine-magnetite veins. Pieces 3 and 7 show talc veins. There is little brittle deformation in this section. Pieces 1, 2, and 3 have several open fractures spaced between 5 and 10 cm from one another. Pieces 4 through 9 have a weak cross-fiber serpentine foliation and open fractures spaced between 5 and 20 cm from one another.

Core Photo



209-1272A-25R-1 (Section top: 118.0 mbsf)

UNIT II: HARZBURGITE

Pieces 1–16

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 73%–83 %
Orthopyroxene	Mode 15%–20 %
	Size 5–10 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: This section consists of altered harzburgite with protogranular texture. Locally the orthopyroxene includes spinel. Pieces 13 to 16 have elongated orthopyroxenes that may represent high temperature foliation.

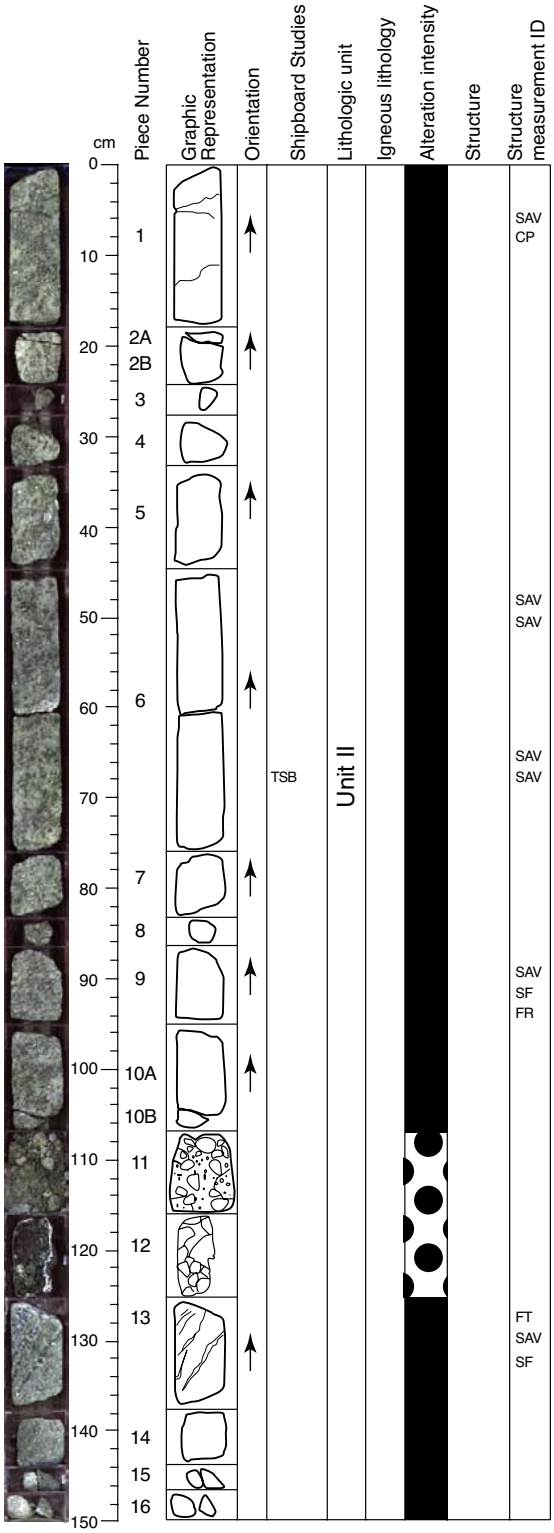
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
This section is composed of completely altered, green harzburgite. In some pieces (e.g., Piece 1) there are patches of gray green alteration in zones of slight clay alteration. Some olivine may be fresh (<1%) in the cores of the serpentine mesh texture. Orthopyroxene is altered dark green serpentine along the rims but fresh in the cores. In Pieces 9 and 10, orthopyroxene alteration intensity increases in proximity to a fault gouge (Pieces 11 and 12), and orthopyroxene is completely altered in the interval below the fault gouge (Pieces 13 to 16). Spinel seems to be fresh in most pieces.

VEINS:
Serpentine (±magnetite) veining is weak in Pieces 6 and 16. Approaching the fault gouge the abundance of serpentine-magnetite veins increases and the veins show a change in direction, possibly due to alignment with the fault plane. Similarly, veining intensity decreases from Pieces 13 to Piece 16 with distance from the fault gouge.

THIN SECTIONS: Sample 1272A-25R-2, 66-69 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 13 is cut by a highly altered serpentine veins that are inclined 65 degrees in the cut face of the core. They may have been magmatic veins, which are now thoroughly altered. Pieces 1, 6, and 7-9 have prominent green serpentine veins. Pieces 1, 6, 7, and 9 have small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 13 is heavily veined with back serpentine crosscut by later talc and the gouge above it (Piece 12) also contains the remains of heavy serpentine veining. Piece 14 is cut by black serpentine veining crosscut by small talc veins. Pieces 7 to 14 show increased fine talc veining. This section is cut by a brittle fault zone. Pieces 11 and 12 are non-cohesive, non-foliated fault gouge composed of clasts and ground matrix both similar to the surrounding serpentinized peridotite. Piece 13 is cut by a fracture on its upper end with slickenfibers indicating dip slip motion. This piece is presumed to be a lower boundary of the overlying fault zone. It is unknown if slip is normal or reverse slip. Pieces 7 through 10 and 13 through 16 display weak cross-fiber serpentine foliation inclined at 30 degrees in the cut face of the core.

Core Photo



209-1272A-25R-2 (Section top: 119.36 mbsf)

UNIT II: HARZBURGITE

Pieces 1–16

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 73%–83 %
Orthopyroxene	Mode 15%–20 %
	Size 5–10 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: This section consists of altered harzburgite with protogranular texture. Locally the orthopyroxene includes spinel. Pieces 13 to 16 have elongated orthopyroxenes that may represent high temperature foliation.

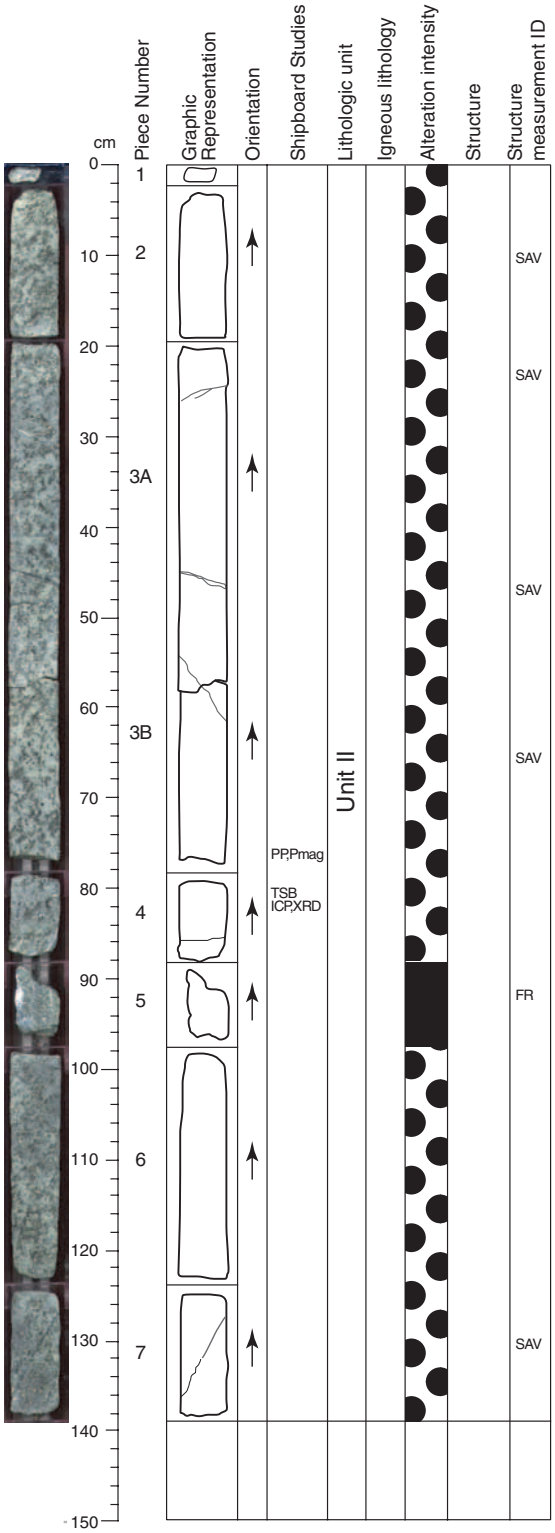
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
This section is composed of completely altered, green harzburgite. In some pieces (e.g., Piece 1) there are patches of gray green alteration in zones of slight clay alteration. Some olivine may be fresh (<1%) in the cores of the serpentine mesh texture. Orthopyroxene is altered dark green serpentine along the rims but fresh in the cores. In Pieces 9 and 10, orthopyroxene alteration intensity increases in proximity to a fault gouge (Pieces 11 and 12), and orthopyroxene is completely altered in the interval below the fault gouge (Pieces 13 to 16). Spinel seems to be fresh in most pieces.

VEINS:
Serpentine (±magnetite) veining is weak in Pieces 6 and 16. Approaching the fault gouge the abundance of serpentine-magnetite veins increases and the veins show a change in direction, possibly due to alignment with the fault plane. Similarly, veining intensity decreases from Pieces 13 to Piece 16 with distance from the fault gouge.

THIN SECTIONS: Sample 1272A-25R-2, 66-69 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 13 is cut by a highly altered serpentine veins that are inclined 65 degrees in the cut face of the core. They may have been magmatic veins, which are now thoroughly altered. Pieces 1, 6, and 7-9 have prominent green serpentine veins. Pieces 1, 6, 7, and 9 have small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 13 is heavily veined with back serpentine crosscut by later talc and the gouge above it (Piece 12) also contains the remains of heavy serpentine veining. Piece 14 is cut by black serpentine veining crosscut by small talc veins. Pieces 7 to 14 show increased fine talc veining. This section is cut by a brittle fault zone. Pieces 11 and 12 are non-cohesive, non-foliated fault gouge composed of clasts and ground matrix both similar to the surrounding serpentinized peridotite. Piece 13 is cut by a fracture on its upper end with slickenfibers indicating dip slip motion. This piece is presumed to be a lower boundary of the overlying fault zone. It is unknown if slip is normal or reverse slip. Pieces 7 through 10 and 13 through 16 display weak cross-fiber serpentine foliation inclined at 30 degrees in the cut face of the core.

Core Photo



209-1272A-26R-1 (Section top: 123.00 mbsf)

UNIT II: HARZBURGITE

Pieces 1–7

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 78%–83 %
Orthopyroxene	Mode 15%–20 %
	Size 5–10 mm
	Shape/Habit Anhedral
Spinel	Mode 2.5%

COMMENTS: This section consists of altered harzburgite with protogranular texture. Locally the orthopyroxene includes spinel. This section contains more spinel than in previous cores.

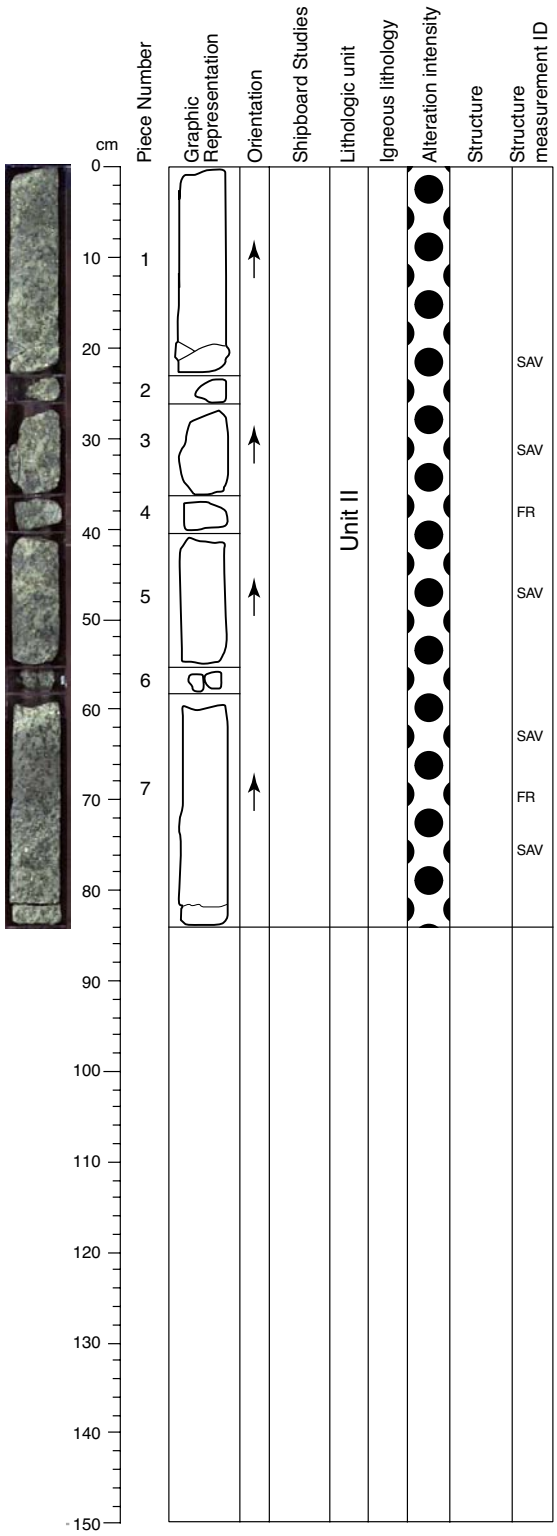
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely altered, green harzburgite with patches of gray green clay alteration. Olivine is altered to serpentine and minor magnetite (in the centers of the mesh texture). Olivine in the centers of the mesh texture is rare (<1%) and present mainly in the gray patches (e.g., Piece 7). Orthopyroxene is altered pseudomorphic bastite and/or green serpentine along the rims and fresh in the cores. Spinel seems to be fresh in most pieces.

VEINS:
Fine wispy serpentine veins are mainly paragranular. These veins crosscut straight, transgranular serpentine-magnetite veins (Pieces 3 and 7).

THIN SECTIONS: Sample 1272A-26R-1, 80-83 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. Piece 2 contains a weak foliation inclined at 45 degrees in the cut face of the core. No obvious crystal plastic foliations were observed within harzburgites in the remainder of the section. Pieces 3 and 7 are cut by prominent green serpentine veins. Both pieces exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Pieces 1 and 3 have talc veins and Pieces 4 and 5 show increased fine talc veining. Piece 3 shows the later green serpentine veins cutting the earlier thin, planar, black serpentine veins. Pieces 4, 5, and the upper 8 cm of Piece 6 are cut by dense fine shear fractures that define a weak foliation with incipient brecciation in some locations.

Core Photo



209-1272A-26R-2 (Section top: 124.39 mbsf)

UNIT II: HARZBURGITE

Pieces 1–7

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 80%
Orthopyroxene	Mode 17%
	Size 3—5 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

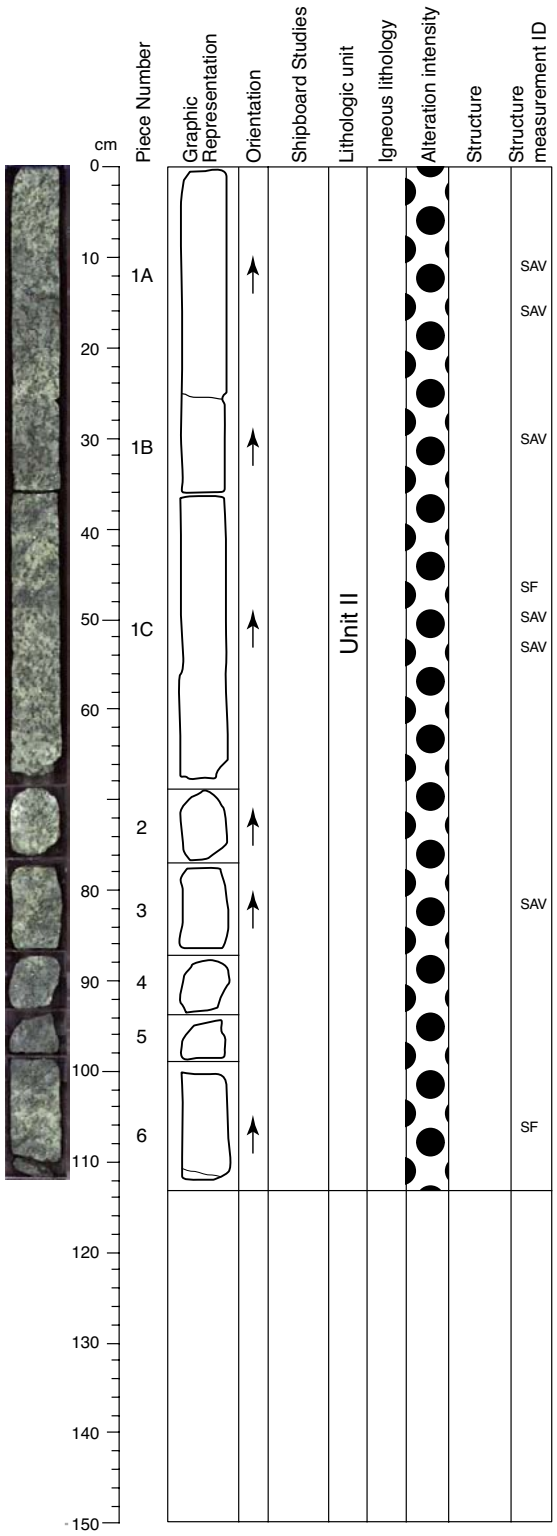
COMMENTS: Altered harzburgite with protogranular texture similar to harzburgite in previous cores. It is characterized by relatively high amount of spinel.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely altered harzburgite. Olivine shows a patchy alteration from gray green to green that is likely due to differences in the intensity of green clay alteration. Orthopyroxene is altered pseudomorphic bastite and/or green serpentine along the rims and fresh in the cores. Dark green serpentine after orthopyroxene is mostly present in light green intervals of the core.

VEINS:
Minor wispy serpentine veins are paragranular to transgranular. In Piece 2 there are two transgranular serpentine-magnetite veins with abundant cross-fractures.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Piece 7 is cut by prominent green serpentine veins with small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 3 shows a thin subvertical serpentine vein. Pieces 1 and 5 show small anastomosing talc veins. There is little brittle deformation in this section. Pieces 2 through 7 contain open fractures spaces more than 10 cm from one another.

Core Photo



209-1272A-26R-3 (Section top: 125.23 mbsf)

UNIT II: HARZBURGITE

Pieces 1–6

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 80%–86 %
Orthopyroxene	Mode 10%–15 %
	Size 3 –7 mm
	Shape/Habit Anhedral
Spinel	Mode 3%–5 %

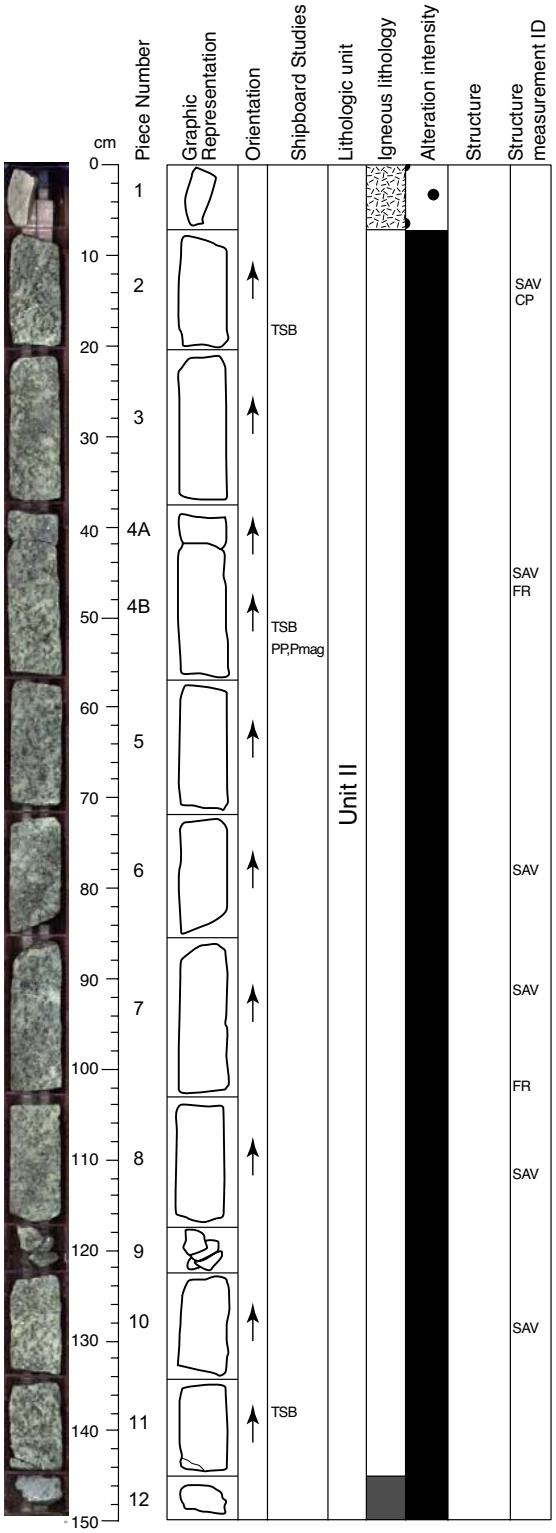
COMMENTS: This section consists of altered harzburgite with protogranular texture. Locally the orthopyroxene includes spinel. This section contains more spinel than in previous cores.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely altered harzburgite. Olivine shows a patchy alteration from gray green to green that is likely due to differences in the intensity of green clay alteration. Orthopyroxene is altered pseudomorphic bastite and/or green serpentine along the rims and fresh in the cores. Dark green serpentine after orthopyroxene is mostly present in light green intervals of the core.

VEINS:
Minor wispy serpentine veinlets are mainly transgranular. In Pieces 1, 2, 3, and 6 there are straight, transgranular serpentine-magnetite veins. In Piece 6, these veins are crosscut by wispy serpentine veinlets.

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture. No obvious crystal plastic foliations were observed within harzburgites in the section. Pieces 1, 2, 3, and 6 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Piece 1 shows crosscutting relationships between serpentine and later talc veins. There is no significant brittle deformation in this section. Pieces 1 through 6 display very weak cross-fiber serpentine foliation.

Core Photo



209-1272A-27R-1 (Section top: 127.0 mbsf)

UNIT II: HARZBURGITE

Pieces 1–12

COLOR: Green

PRIMARY MINERALOGY:

Olivine	Mode 73%–85%
Orthopyroxene	Mode 10%–20%
	Size 3–7 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: The core starts has a single piece of microgabbro in Piece 1. Pieces 2-11 are altered harzburgite with protogranular texture and a significant modal spinel. Piece 12 is altered dunite with 93% olivine, 2% orthopyroxene, and 5% spinel.

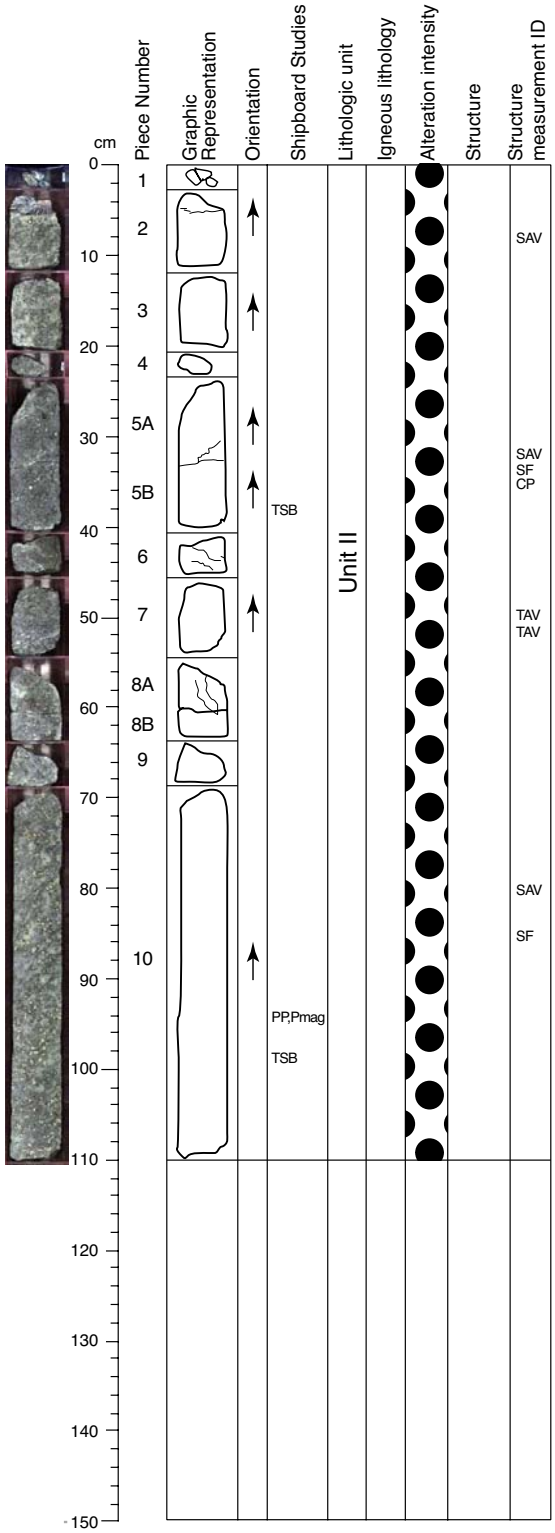
SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely serpentinized harzburgite with variable overprint of green and gray green clay alteration. The orthopyroxene is partly altered to green serpentine along the rims, while the cores are commonly fresh

VEINS:
This section contains weak, wispy, paragranular serpentine veins. Pieces 6, 8, and 10 contain minor single serpentine-magnetite veins.

THIN SECTIONS: Samples 1272A-27R-1, 17-19 cm, 1272A-27R-1, 50-52 cm, 1272A-27R-1, 136-138 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture (Pieces 2-12) and basalt (Piece 1). No obvious crystal plastic foliation is observed within harzburgites in the section. Pieces 3, 6, 8, and 10 are cut by prominent green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Pieces 2, 6, 7, 10, and 12 show conspicuous small talc veins, with Piece 6 showing crosscutting relations between talc and earlier green serpentine. Pieces 2 through 12 have open fractures spaces more than 10 cm from one another. Pieces 2 through 12 have very faint cross-fiber serpentine foliation.

Core Photo



209-1272A-27R-2 (Section top: 128.5 mbsf)

UNIT II: HARZBURGITE

Pieces 1–10

COLOR:

PRIMARY MINERALOGY:

Olivine	Mode 79%–88 %
Orthopyroxene	Mode 10%–15%
	Size 4–7 mm
	Shape/Habit Anhedral
Spinel	Mode 2%

COMMENTS: The core consists of altered harzburgite with protogranular texture that is similar to the altered harzburgite in Section 1272A-27R-1.

SECONDARY MINERALOGY:
TOTAL ROCK ALTERATION (%): 97
The section is composed of completely serpentinized harzburgite with variable overprint of green and gray green clay alteration. The orthopyroxene is partly altered to green serpentine along the rims, while the cores are commonly fresh

VEINS:
This section contains weak, wispy, paragranular serpentine veins. Pieces 2, 4, and 10 contain minor serpentine-magnetite veins.

THIN SECTIONS: Samples 1272A-27R-2, 36-39 cm and 1272-27R-2, 97-99 cm

STRUCTURE:
The section consists of highly altered serpentinized harzburgite with protogranular texture and dunite in Piece 5. No obvious crystal plastic foliation is observed within harzburgites in the section. The orthopyroxene-bearing dunite in Piece 5 is inclined at 32 degrees in the cut face of the core. Piece 1 shows a zone of anastomosing black serpentine veins cut by later white talc veins. Pieces 5 and 10 have green serpentine veins. Most exhibit small, subhorizontal, talc-filled veins orthogonally cutting the serpentine veins. Pieces 5, 6, and 7 show conspicuous small talc veins, with Piece 6 showing crosscutting relations between talc and earlier green serpentine. Pieces 5 through 10 have weak cross-fiber serpentine foliation inclined parallel to the dunite layer.

THIN SECTION:	**209-1272A-1R-1, Piece 2, 9-12 cm**	**TS#154**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	2	80			
Orthopyroxene	5	19	4-9	Anhedral	Include and/or surrounded by vermicular spinel.
Spinel	<0.5	1	0.5-1	Anhedral	

GENERAL COMMENTS

Vermicular spinel aggregates in orthopyroxene pseudomorph. Mostly altered.
Olivine is recrystallized and preserved in a few domains
Only the core of orthopyroxene is fresh.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	50	Olivine, orthopyroxene		
Clay/Fe-oxyhydroxide	40	Olivine		Most of this could be brown stained serpentine.
Talc	1	Orthopyroxene		Along margins of orthopyroxene pseudomorphs.
Carbonate	1	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine-clay veins	3		Network of cross-fiber serpentine veins with high birefringent clay/talc.
Carbonate	2	Blocky	Crosscut serpentine-clay veins.
Fe-oxyhydroxide	Trace		Crosscut serpentine-clay veins.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Disjointed hourglass texture serpentinite suggests possible fracturing during serpentinization.
Late shear fractures are filled with serpentine and talc.

Crosscutting Relationships (as are apparent in thin section):

1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-1R-1, Piece 7, 41-43 cm**	**TS#155**	**Observer: WM, AC, WB**
ROCK NAME:	**OLIVINE GABBRONORITE**		
GRAIN SIZE:	**Fine-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	40	55	2 - 7	Euhedral	An 60
Olivine	4	12			
Clinopyroxene	5	17	2 - 4	Subhedral to euhedral	
Orthopyroxene	4	14	2 - 4	Subhedral to euhedral	
Quartz	Trace?	Trace?			
Ilmenite	1.5	2	1 - 2	Interstitial	

GENERAL COMMENTS

This fine-grained gabbronorite has a felty texture but is more massive in character than a diabase.
Plagioclase shows strong optical zonation.
Proportions of pyroxene are sketchy as they are often too altered to reliably judge what they were.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite/smectite	5	Plagioclase, pyroxene, olivine	Fibrous	Too high birefringence for chlorite; is probably a mixed-layer phase.
Talc	10	Olivine, plagioclase	Fibrous	
Green amphibole	1	Plagioclase, pyroxene	Acicular	
Magnetite	1	Olivine, FeTi-oxide	Euhedral	Exsolution/oxidation breakdown of FeT-oxides.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Minor crystal plastic deformation; undulose extinction and deformation twins in plagioclase; no recrystallization or grain size reduction.

Brittle:
None visible in thin section.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Static greenschist grade alteration

THIN SECTION:	**209-1272A-2R-1, Piece 9, 66-68 cm**	**TS#156**	**Observer: AC / CG**
ROCK NAME:	**DUNITE**		
GRAIN SIZE:			
TEXTURE:			

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	98			
Spinel	1	2	0.5-1	Subhedral	Reddish color.

GENERAL COMMENTS Very altered dunite. Few relics of spinel still preserved and dispersed in the matrix, subeuhedral shape

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Clays (red)	50	Serpentine, olivine		
Carbonates	3	Serpentine, olivine		
Serpentine	44	Olivine		
Ferro-chromite	0.8	Spinel		
Iron oxides (maghemite?)	1	Spinel, Magnetite		
Talc	0.2	Serpentine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Carbonate vein (aragonite)		Subhedral, acicular	Rimmed by red clays. Two crosscutting generations.
Serpentine veins		Massive	

STRUCTURE
Pervasive static alteration obscures all deformation textures.

Crosscutting Relationships (as are apparent in thin section):

THIN SECTION:	**209-1272A-3R-1, Piece 8A, 96-98 cm**	**TS#157**	**Observer: WM, AC, WB**
ROCK NAME:	**GABBRONORITE**		
GRAIN SIZE:	**Medium**		
TEXTURE:	**Miarolitic - granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	50	55	2 - 7	Euhedral	An45
Olivine	8	12	1 - 3	Poikiolitic	
Clinopyroxene	5	9	2 - 4	Subhedral to euhedral	
Orthopyroxene	1	2	2 - 4	Subhedral to euhedral	
Oxides	1.5	2	1 - 2	Quench	
Quartz	5	5	1 -2	Subhedral	Interstitial and associated with cavities.
Apatite	Trace	Trace	small	Needles	Included in plagioclase and quartz.
Biotite	1	1	<1	Euhedral	
Brown amphibole	Trace	1	<1	Euhedral	Partly altered to green amphibole.
Cavities	5	5	2 - 7		

GENERAL COMMENTS
The large porosity in this rock is interpreted to reflect space occupied by exsolved volatiles.
Quartz is most common near cavities. Quartz and plagioclase near cavities contain significant amount of apatite needles.
The oxide is predominately magnetite with oxy-exsolution of ilmenite. The oxide texture is a quench texture.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Green amphibole	8	Pyroxene, plagioclase, brown amphibole	Acicular	
Chlorite/smectite	5	Plagioclase, pyroxene	Fibrous	
Albite	2	Plagioclase	Anhedral	Along grain boundaries.
Quartz	Trace	Plagioclase, clinopyroxene	Anhedral	Rare along with chlorite/smectite
Talc	1	Clinopyroxene	Fibrous	Patchy.
Pyrite	0.5	Plagioclase, clinopyroxene	Subhedral	Could be recrystallized primary sulfide.
Magnetite	Trace	FeTi-oxides	Anhedral	Exsolution/oxidation of FeTi-oxides.
Other Fe-oxides	0.5		Anhedral	Pervasive in oxidized halo.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins			

STRUCTURE
Crystal Plastic:
Very minor ductile deformation; minor undulose extinction and deformation twins in plagioclase; no grain size reduction or recrystallization.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Alteration

THIN SECTION:	**209-1272A-3R-1, Piece 9, 111-114 cm**	**TS#158**	**Observer: WM, HP**
ROCK NAME:	**DIABASE**		
GRAIN SIZE:	**Fine-grained**		
TEXTURE:	**Felty**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	60	65	0.3 - 2	Euhedral/acicular	
Olivine	7	10	0.3	Equant	
Clinopyroxene	15	18	0.3	Subhedral/interstitial	
Oxides	2	2	0.2	Subhedral	
glass	0	5	0.4	Interstitial	

GENERAL COMMENTS

The texture is uniformly felty with acicular plagioclase and subequant mafic minerals. Plagioclase are strongly elongate and form star-shaped aggregates. Rapid cooling?
There is a single large olivine crystal 1 mm in size.
Less than 1% of the plagioclase is present as larger crystals (1 - 3 mm) and these show complex concentric zoning.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Brown clays?	15	Glass, olivine, pyroxene, plagioclase	Very fine-grained aggregates	Glass completely replaced to brown clay (+oxides?). Replacement of crystals along margins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Static greenschist grade alteration

THIN SECTION:	**209-1272A-4R-1, Piece 14, 87-90 cm**	**TS#159**	**Observer: WM, AC, JH**
ROCK NAME:	**GABBRONORITE**		
GRAIN SIZE:	**Medium-grained**		
TEXTURE:	**Miarolitic to granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	52	55	2 - 7	Euhedral	Estimate An 60.
Olivine	1	2	1-3	Anhedral	
Clinopyroxene	12	15	2 - 4	Subhedral to euhedral	
Orthopyroxene	1	3	2 - 4	Subhedral to euhedral	
Oxides	1.5	2	1 - 2	Quench	
Quartz	8	8	1 -2	Subhedral	
Apatite	Trace	Trace	small	Needles	Included in plagioclase and quartz.
Cavities	10	15	2 - 7		

GENERAL COMMENTS

The large porosity in this rock is interpreted to reflect space occupied by exsolved volatiles.
Quartz is most common near cavities. Quartz and plagioclase near cavities contain significant amount of apatite needles.
The oxide is predominately magnetite with oxy-exsolution of ilmenite. The oxide texture is a quench texture.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Amphibole	14.5	pyroxenes and plagioclase	Subhedral and granular	Subhedral amphibole after pyroxenes interstitial to plagioclase. Perhaps some amphibole along cleavage planes of plagioclase.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; minor undulose extinction and deformation twins in plagioclase; no grain size reduction or recrystallization.

Crosscutting Relationships (as are apparent in thin section):

1) Minor ductile deformation
2) Alteration

THIN SECTION:	**209-1272A-7R-1, Piece 14, 87-89 cm**	**TS#160**	**Observer: WM, AC, HP**
ROCK NAME:	**DEVITRIFIED GLASS**		
GRAIN SIZE:			
TEXTURE:	**Spherulitic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	Trace	Trace	1	Euhedral	Estimate An 60.
Olivine	Trace	Trace	1.5	Subhedral	
Spherulites	85	95	<1		Consist mainly of elongated radiating plagioclase.
Very fine fibrous microlites	10	10	<<1		Very fine brown, interwoven microlites, forming the matrix between spherulites in less-crystalline part of the section.
Glass	0	5			

GENERAL COMMENTS

This sample is made of spherulites formed during high-temperature devitrification with a few crystals of plagioclase and olivine.
Plagioclase and olivine show morphologies indicative of quench crystallization.
There is a gradual increase in spherulite crystal size and abundance of spherulites within the thin section. The larger part consists of interlocking comparativley large spherulites.
In the lower part (adjacent to the label) isolated spherulites are hosted in a matrix of extremely fine, brown microlites which, in turn contain irregular domains of altered glass.
The sample represents a high-temperature devitrification front which probably developed at the margin of a shallow intrusive body.
The spherulites formed during rapid cooling, however, in some parts the cooling rate was high enough to form glass. The areas with brown, hair-like crystals represent an intermediate stage.
The XRD analysis of this sample indicates that the fine minerals in the groundmass are a mixture of plagioclase, clinopyroxene, and amphibole.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Cryptocrystalline black aggregates	5	Glass	Irregular aggregates between brown, very-fine hairlike groundmass domains.	This material is too fine to be identified optically.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

No deformation visible through pervasive alteration of sample

Crosscutting Relationships (as are apparent in thin section):

THIN SECTION:	**209-1272A-7R-1, Piece 15, 94-96 cm**	**TS#161**	**Observer: WM, HP**
ROCK NAME:	**BASALT**		
GRAIN SIZE:	**Fine-grained**		
TEXTURE:	**Felty**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Plagioclase	30	40	1	Acicular	
Olivine	5	25	2	Subhedral	Includes oxides.
Clinopyroxene	2	14		Anhedral	
Oxides	1	1		Subhedral/equant	
Glass	0	20			

GENERAL COMMENTS
Alteration has obscured the proportion of mafic minerals and glass in this sample.
Plagioclase defines a felty matrix that host glass and pyroxenes while olivine locally encloses plagioclase laths.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Green amphibole	20	Olivine, clinopyroxene		
Brown clay/mica	40	Glass, olivine, clinopyroxene, plagioclase	Interstitial to the plagioclase laths	Alteration of plagioclase along grain margins.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE
Sample is undeformed

Crosscutting Relationships (as are apparent in thin section):

THIN SECTION:	**209-1272A-7R-1, Piece 17, 113-115 cm**	**TS#162**	**Observer: WM, AC, HP**
ROCK NAME:	**DEVITRIFIED GLASS**		
GRAIN SIZE:			
TEXTURE:	**Spherulitic to spinnifex-like**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	Trace	Trace	2	Subhedral	
Plagioclase	1	1		Needles, often with quench textures	
Spherulites	90	90			
Glass	0	9			

GENERAL COMMENTS

This sample is made of spherulites of devitrified glass with a few crystals of olivine at the center of the spherule.
There are abundant skeletal plagioclase quench crystals in the groundmass.
The spherulites consist of relatively large plagioclase laths and locally form interlocking aggregates resembling spinnifex texture.
The spherulites formed during rapid cooling of the magma due to high-temperature devitrification, and represent a primary texture.
Some glassy material was trapped between the spherulitic plagioclase crystals and has been altered.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Brown-gray clay?	9	Glass	Interstitial domains between plagioclase laths and spherulites	Very fine grained. Too fine for optical identification.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
No veins.			

STRUCTURE

No deformation textures are visible through pervasive alteration.

Crosscutting Relationships (as are apparent in thin section):

THIN SECTION:	**209-1272A-16R-1, Piece 2, 134-136 cm**	**TS#163**	**Observer: AC / CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	73			
Orthopyroxene	0	25	3-7	Anhedral	
Clinopyroxene	?	?			
Spinel	<0.5	1	0.1-0.2	Anhedral	

GENERAL COMMENTS
Very few domains (0.1 mm) of recrystallized olivine dispersed in the serpentine matrix.
Vermicular spinel aggregates with orthopyroxene pseudomorph.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	97.5	Olivine, orthopyroxene	Mesh and rare ribbon textures.	Rare bastite pseudomorphs after orthopyroxene.
Magnetite	0.5	Olivine		
Talc	0.5	Orthopyroxene		Along orthopyroxene grain boundaries.
Ferrochromite	0.5			

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal. Transgranular. Cross-fiber	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-13R-2, Piece 4, 33-36 cm**	**TS#164**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	78			
Orthopyroxene	0	20	2-7	Anhedral	
Clinopyroxene	?	?			
spinel	1	1.5	0.1-2	Anhedral	

COMMENTS
No primary mineralogy preserved except for spinel
Vermicular spinel aggregates with orthopyroxene pseudomorph.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	95	Olivine, orthopyroxene		Mesh-rim texture with isotropic cores. Patches with alpha serpentine ribbon textures.
Clay	3	Olivine		Brown patches.
Carbonate	Trace	Olivine	Anhedral	
Magnetite	1	Olivine	Euhedral	
Brucite	1	Olivine		Identification uncertain because of presence of brown clay.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			Both alpha and gamma serpentine in crosscutting veins.

STRUCTURE
Crystal Plastic:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-13R-1, Piece15, 93-95 cm**	**TS#165**	**Observer: AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	70			
Orthopyroxene	0	28	3-7	Anhedral	
Clinopyroxene	?	?			
Spinel	1	1.5	0.1-0.2	Anhedral	

COMMENTS Very few domains (0.1 mm) of recrystallized olivine dispersed in the serpentine matrix.
Vermicular spinel aggregates with orthopyroxene pseudomorph.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine (Lizardite)	83	Olivine, orthopyroxene	Mesh textures and rare ribbon textures after olivine.	Bastite pseudomorphs and interlocking textures after orthopyroxene.
Magnetite	0.5	Olivine		
Clay minerals	7.5	Olivine	Cores of mesh textures.	
Brucite	7	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Composite.	

STRUCTURE
Crystal Plastic:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentinite.

Crosscutting Relationships (as are apparent in thin section): 1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-14R-1, Piece 3C, 25-28 cm**	**TS#166**	**Observer: AC, JH**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	75			
Orthopyroxene	0	23	3-10	Anhedral	
Clinopyroxene	?	?			
Spinel	1	2	0.1-2	Anhedral	Brownish/yellowish spinel and brownish/reddish spinel.

GENERAL COMMENTS
No primary mineralogy preserved except for spinel
Vermicular spinel aggregates with orthopyroxene pseudomorphs.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	86	Olivine, orthopyroxene	Core and rim structure grading to ribbon textures.	Former grain boundaries practically obliterated.
Magnetite	3	Olivine, spinel	Mostly anhedral after spinel. Anhedral in stringers in ribbon textures.	
Brown clays?	10	Olivine, serpentine	Microgranular, confined mainly to former olivine cores after olivine/ serpentine and after serpentine in rims.	Fibrous, finely disseminated throughout serpentine.
Chlorite	trace			

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile		Cross-fibers in sigmoidal veins.	
Magnetite		Anhedral in chrysotile veins.	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-17R-1, Piece 10, 56-58 cm**	**TS#167**	**Observer: AC / CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	66			
Orthopyroxene	0	32	3-11	Anhedral	
Clinopyroxene	?	?			
Spinel	1	2	0.1-4	Anhedral	

GENERAL COMMENTS
No primary mineralogy preserved except for spinel
Vermicular spinel aggregates with orthopyroxene pseudomorph.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	95	Olivine, orthopyroxene	Mesh and ribbon textures.	Massive serpentine and bastite replace orthopyroxene.
Magnetite	1	Olivine, magnetite		
Clay minerals(?)	4	Olivine	Cores of mesh textures. Lizardite bands.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Bent cleavage and kink bands in pyroxene.

Foliation:
Moderate foliation defined by mesh texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-17R-1, Piece 19, 127-129 cm**	**TS#168**	**Observer: AC / CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	74			
Orthopyroxene	0	25	3-8	Anhedral	
Clinopyroxene	?	?			
Spinel	1	1.5	0.1-3	Anhedral	Simplectic spinel with orthopyroxene

GENERAL COMMENTS
No primary mineralogy preserved except for spinel
Vermicular spinel aggregates with orthopyroxene pseudomorph. Simplectic intergrowth of spinel and orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine (Lizardite and Chrysotile)	88	Olivine, orthopyroxene	Mesh and ribbon textures.	Interlocking textures and bastite pseudomorph after orthopyroxene.
Magnetite	0.5	Olivine, spinel	Subhedral.	
Talc	Trace	Orthopyroxene	Patchy	Along orthopyroxene grain boundaries
Clay minerals	11.5	Olivine		Replacing core of mesh textures. Intergrown with serpentine.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Cross-fiber. Transgranular.	

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Bent cleavage and kink bands in pyroxene.

Brittle:
None visible in thin section.

Foliation:
Moderate foliation defined by mesh texture serpentinite

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-18R-1, Piece 6, 46-48 cm**	**TS#169**	**Observer: AC, JH**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	69			
Orthopyroxene	0	30	3-10	Anhedral	
Clinopyroxene	?	?			
Spinel	1	1.5	0.1-3	Anhedral	Simplectic spinel plus orthopyroxene.

COMMENTS No primary mineralogy preserved except for spinel
Vermicular spinel aggregates with orthopyroxene pseudomorph. Simplectic intergrowth of spinel and orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	87	Olivine, orthopyroxene	Mostly core and rim structures after olivine,	Pseudomorphic after orthopyroxenes
Iron oxides	3	Orthopyroxene, spinel, olivine	Rims orthopyroxene and penetrates cleavage, anhedral after skeletal spinel,	Minor amounts in rims of former olivine, possibly stains whole section.
Brown clays	10	Olivine, serpentine	Microgranular	Present in net texture core in former olivine.
Brucite	Trace			
Chlorite	Trace			

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Cross fiber chrysotile, vermicular vein fill - oddly curved chrysotile(?)	Some wholly chrysotile sigmoidal veins.
Iron oxides		Subhedral to anhedral, often completely filling sigmoidal veins	

STRUCTURE

Crystal Plastic:
Very minor crstal plastic deformation; Bent cleavage and kink bands in pyroxene.

Foliation:
Moderate foliation defined by mesh texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-19R-1, Piece 6, 33-35 cm**	**TS#170**	**Observer: AC, WM, CG**
ROCK NAME:	**OXIDE GABBRONORITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Granular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Clinopyroxene	30	45	3-10	Equant	
Orthopyroxene	5	42	<01	Equant	Exsolved clinopyroxene.
Plagioclase	0.5	8	0.1-3	Subhedral/equant	
Oxide	5	5		Interstitial	

GENERAL COMMENTS
This sample has been deformed as evidence by abundant neoblast of clinopyroxene and plagioclase.
The oxide is predominately ilmenite.
There are coarse-exsolution lamellae of clinopyroxene in the freshest orthopyroxene grain.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Chlorite	7.5	Plagioclase	Fine aggregates and subhedral chlorites.	
Talc	Trace	Pyroxenes		Vein crosscutting Fe-Ti-oxides.
Amphibole	52	Orthopyroxene, clinopyroxene	Fibrous.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Composite vein		Amphibole, talc	

STRUCTURE

Crystal Plastic:
Moderate intensity ductile deformation; Recrystallization of clinopyroxene around grain boundaries to polygonal neoblasts (0.03 mm to 0.1 mm).
Recrystallization of plagioclase where unaltered to irregular-shaped neoblasts with bulging grain boundaries (0.05 mm to 0.2 mm).

Brittle:
Oxide-rich zones of thin section are slightly brecciated, with pyroxene neoblasts suspended within a matrix of oxide.

Foliation:
Very weak foliation defined by shape preferred orientation of pyroxene porphyroclasts.

Impregnation Textures:
Melt crystallizing oxides may have infiltrated along brittle shears.

Crosscutting Relationships (as are apparent in thin section):
1) Ductile deformation
2) Minor brittle deformation during oxide magma impregnation
3) Greenschist facies alteration

THIN SECTION:	**209-1272A-19R-2, Piece 3B, 27-29 cm**	**TS#171**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	74			
Orthopyroxene	0	25	3-12	Anhedral	
Clinopyroxene	?	?			
Spinel	1	1.5	0.1-3	Anhedral	

GENERAL COMMENTS No primary mineralogy preserved except for spinel

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, orthopyroxene		Alpha serpentine ribbon textures cut by chrysotile.
Clay	8	Olivine, orthopyroxene		Brown patches.
Magnetite	1	Olivine	Euhedral	
Brucite	1	Olivine		Identification uncertain because of presence of brown clay.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			Both alpha and gamma serpentine in crosscutting veins, Some veins have coarse magnetite.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Bent cleavage and kink bands in pyroxene.

Brittle:
None visible in thin section.

Foliation:
Moderate foliation defined by mesh texture serpentinite.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-21R-1, Piece 4, 50-53 cm**	**TS#172**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	79			
Orthopyroxene	1	20	3-10	Anhedral	Clusters of 2 to 3 large crystals.
Clinopyroxene	?	?			
Spinel	1	1.5	0.1	Anhedral	

GENERAL COMMENTS No primary mineralogy preserved except for spinel

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96	Olivine, orthopyroxene		Mesh texture with serpentine rims.
Clay	1	Olivine, orthopyroxene		Brown patches.
Magnetite	1	Olivine	Euhedral	In the centers of mesh rim texture.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			Both alpha and gamma serpentine in crosscutting veins Some veins have coarse magnetite.

STRUCTURE

Thin section contains no deformation textures or foliation.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinzation
2) Serpentine veins

THIN SECTION:	**209-1272A-23R-1, Piece 2, 7-11 cm**	**TS#173**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE/DUNITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Harzburgite:					
Olivine	Trace	91			
Orthopyroxene	2	20	3-10	Anhedral	Fresh cores
Clinopyroxene					
Spinel	1.5	2	0.1	Euhedral to anhedral	Inclusions within orthopyroxene
Dunite:					
Olivine		100			
Orthopyroxene					
Clinopyroxene					
Spinel					

GENERAL COMMENTS Thin section cut across dunite - harzburgite limit
Modifications of the spinel shape in the harzburgite near the dunite

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine (Lizardite)	96	Olivine, orthopyroxene	Mesh textures and rare ribbon textures with lizardite in mesh	Fibrous and interlocking textures where replace orthopyroxene. Bastite pseudomorphic after orthopyroxene.
Magnetite	1.5	Olivine	Subhedral	Fills the core of serpentine mesh textures.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine vein			Cross-fractures of cross-fiber chrysotile veins.
Chrysotile vein		Sigmoidal. Cross-fiber	Several generations. Crosscut by banded serpentine vein.

STRUCTURE

Crystal Plastic:
Very minor crystal plastic deformation; Kink bands in pyroxene.

Brittle:
None visible in thin section.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-23R-1, Piece 3, 62-64 cm**	**TS#174**	**Observer: AC, JH**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0	80			
Orthopyroxene	1	15		Anhedral	
Clinopyroxene	?	2	<0.5	Interstitial	At orthopyroxene borders.
Spinel	1.5	2		Anhedral	

GENERAL COMMENTS Fresh core of orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	90	Olivine, orthopyroxene	Core and rim structures away from central vein.	
Magnetite/iron oxides	3	Olivine, orthopyroxene	Anhedral after spinel, euhedral in former olivine cores. Penetrate cleavage of orthopyroxene.	
Brown clays?	7	Olivine	Microgranular.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine		Chrysotile sigmoidal veins perpendicular to main serpentine vein	
Magnetite / iron oxides		Anhedral in sigmoidal veins	

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Several shear fractures with minimal offset cut pseudomorphed pyroxene grains; fractures appear to post-date alteration.

Foliation:
Very minor foliation in parts of thin section defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Late shear fractures

THIN SECTION:	**209-1272A-24R-1, Piece 11, 74-76 cm**	**TS#175**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	80			Some fresh recrystallized olivine.
Orthopyroxene	1	15		Anhedral	Fresh only little pieces of the core of grains.
Clinopyroxene	?	?			
Spinel	1	2		Anhedral	

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	95	Olivine, orthopyroxene		Mesh texture with serpentine rims.
Clay	1	Olivine, orthopyroxene		Brown patches.
Magnetite	1	Olivine	Euhedral	In the centers of mesh rim texture.

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			Cross-fiber, length-slow.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Brittle:
Several shear fractures with minimal offset cut pseudomorphed pyroxene grains; fractures appear to post-date alteration.

Foliation:
Very minor foliation in parts of thin section defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins
3) Late shear fractures

THIN SECTION:	**209-1272A-24R-1, Piece 5, 81-83 cm**	**TS#176**	**Observer: AC, WB**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	82			Some fresh recrystallized olivine.
Orthopyroxene	1	12	2-3	Anhedral	One core is fresh.
Clinopyroxene	?	?			
Spinel	1	2		Anhedral	

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96	Olivine, orthopyroxene		Alpha serpentine ribbon textures cut by chrysotile.
Clay	Trace	Olivine, orthopyroxene		Brown patches.
Magnetite	1	Olivine	Euhedral	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Serpentine veins			
Chrysotile veins			Crosscutting serpentine veins.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; kink banding and bent cleavage in pyroxene.

Brittle:
Several shear fractures with minimal offset cut pseudomorphed pyroxene grains; fractures appear to post-date alteration.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins
4) Late shear fractures

THIN SECTION:	**209-1272A-25R-1, Piece 15, 123-126 cm**	**TS#177**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	3	89			Some fresh recrystallized olivine.
Orthopyroxene	5	11	1-4	Anhedral	Fresh cores.
Clinopyroxene	1	2	<0.5	Interstitial	At orthopyroxene borders.
Spinel	0.5	1	<0.5	Anhedral	

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	93	Olivine, orthopyroxene	Mesh texture	Length-fast serpentine in rims of mesh texture after olivine. Interlocking textures and bastite pseudomorph after orthopyroxene.
Magnetite	1.5	Olivine	Subhedral to anhedral	Filling center of mesh texture.
Clays	Trace	Olivine		
Brucite	Trace	Olivine	Patchy	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal	Cross-fiber. Length slow serpentine.

STRUCTURE

Crystal Plastic:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Serpentinization
2) Serpentine veins

THIN SECTION:	**209-1272A-25R-2, Piece 6, 66-69 cm**	**TS#178**	**Observer: AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0.5	84			Very few little grains of recrystallized olivine.
Orthopyroxene	1	15	1-4	Anhedral	Very few fresh cores.
Clinopyroxene	?	1-2	<0.5	Interstitial	At orthopyroxene borders.
Spinel	0.5	1.5	<0.5	Anhedral	

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	97.5	Olivine, orthopyroxene, clinopyroxene	Fibrous	Length-fast serpentine (Lizardite) in the rims of mesh textures. Orthopyroxene mostly replaced by bastite pseudomorphs.
Magnetite	0.5	Olivine	Subhedral to anhedral	Filling core of serpentine mesh textures.
Clays	Trace			

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal	Length-slow serpentine. Cross-fiber.

STRUCTURE

Crystal Plastic: None visible in thin section.

Foliation: Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section): 1) Serpentinization 2) Serpentine veins

THIN SECTION:	**209-1272A-26R-1, Piece 4, 80-83 cm**	**TS#179**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular to slightly porphyroclastic**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	0.5	83			Very few little grains of recrystallized olivine.
Orthopyroxene	0.5	15	2-6	Anhedral	Very few fresh cores.
Clinopyroxene	?	1-2	<0.5	Interstitial	At orthopyroxene borders.
Spinel	0.5	1.5	<0.5	Anhedral	

GENERAL COMMENTS
Vermicular spinel aggregates with orthopyroxene pseudomorph.
Simplectic intergrowth of spinel and orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96.5	Olivine, orthopyroxene, clinopyroxene.	Ribbon and mesh textures	Fast-length cross-fiber serpentine (Lizardite) in the rims of the mesh and ribbon textures. Bastite pseudomorphs after orthopyroxene.
Magnetite	1	Olivine	Anhedral	In core of serpentine mesh textures.
Brucite	1	Olivine	Patchy	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile		Sigmoidal	Slow-length serpentine (Chrysotile). Cross-fiber.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Cross cutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-27R-1, Piece 2, 17-19 cm**	**TS#180**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1.5	79			Very few little grains of recrystallized olivine.
Orthopyroxene	5	20	3-9	Anhedral	Very few fresh cores; clusters of 2 to 3 crystals.
Clinopyroxene	1	2	<0.5	Interstitial	At orthopyroxene borders and junctions.
Spinel	0.5	1	<0.5	Anhedral	

GENERAL COMMENTS Simplectic intergrowth of spinel and orthopyroxene.

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	96	Olivine, orthopyroxene, clinopyroxene.	Ribbon and mesh textures.	Rim of mesh texture composed of cross-fiber length-fast serpentine (lizardite). Bastite pseudomorphs after orthopyroxene.
Magnetite	0.5	Olivine	Anhedral	Disseminated and filling the cores of the mesh texture.
Brucite?	Trace	Olivine		
Clays	1	Olivine	Patchy	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal	Length-slow serpentine. Cross-fiber. Usually dusty due to clays intergrowths.

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-27R-1, Piece 4B, 50-52 cm**	**TS#181**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1.5	79			
Orthopyroxene	5	20	3-9	Anhedral	
Clinopyroxene	?	1	<0.5	Interstitial	At orthopyroxene borders.
Spinel	0.5	1	<0.5	Anhedral	

GENERAL COMMENTS
Simplectic intergrowth of spinel and orthopyroxene.
Vermicular spinel associated with orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	95.5	Olivine, orthopyroxene, clinopyroxene.	Ribbon to mesh textures.	Ribbon texture made up of cross-fiber length-fast serpentine (lizardite). Bastite pseudomorph after orthopyroxene.
Magnetite	1	Olivine, spinel	Subhedral to anhedral	In cores of mesh textures.
Talc	Trace	Orthopyroxene	Fibrous	Rimming bastite pseudomorph after orthopyroxene.
Clay	1	Olivine	Patchy	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Sigmoidal.	Two crosscutting generations.

STRUCTURE
Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-27R-1, Piece 4B, 136-138 cm**	**TS#182**	**Observer: AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	84			
Orthopyroxene	2	15	3-7	Anhedral	
Clinopyroxene	?	?			
Spinel	0.5	1.5	<0.5	Anhedral	

GENERAL COMMENTS
Simplectic intergrowth of spinel and orthopyroxene.
Vermicular spinel associated with orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	94.5	Olivine/orthopyroxene	Massive replacement of orthopyroxene, some core and rim structures in olivine.	
Magnetite/iron oxides	2	Olivine	Some euhedral cores of former olivine, general iron oxide staining of section.	

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Iron oxides		Rare iron oxides in small sigmoidal veins	

STRUCTURE
Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-27R-2, Piece 5B, 36-39 cm**	**TS#183**	**Observer: AC**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**coarse**		
TEXTURE:	**protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	1	79			
Orthopyroxene	0.5	20	4-10	Anhedral	
Clinopyroxene	?	1	<0.5	Interstitial	At orthopyroxene borders.
Spinel	1	1.5	<0.5	Anhedral	

GENERAL COMMENTS
Simplectic intergrowth of spinel and orthopyroxene.
Vermicular spinel associated with orthopyroxene

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	95.5	Olivine, orthopyroxene, clinopyroxene.	Ribbon and mesh textures.	Cross-fiber length-fast serpentine (lizardite) in rims of mesh and ribbon textures. In some areas, closely banded with cross-fiber chrysotile veins.
Magnetite	1	Olivine, spinel	Subhedral to anhedral	Filling cores of serpentine mesh textures.
Clays	1	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Irregular and sigmoidal	Cross-fiber, length-slow serpentine. At least two crosscutting generations.
Serpentine veins		Irregular, straight and banded	

STRUCTURE
Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene.

Foliation:
Moderate foliation defined by ribbon texture serpentine.

Cross Cutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins

THIN SECTION:	**209-1272A-27R-2, Piece 10, 97-99 cm**	**TS#184**	**Observer: AC, CG**
ROCK NAME:	**HARZBURGITE**		
GRAIN SIZE:	**Coarse-grained**		
TEXTURE:	**Protogranular**		

	MODE (Visual estimate)				
PRIMARY MINERALOGY	**PERCENT PRESENT**	**PERCENT ORIGINAL**	**SIZE (mm)**	**MORPHOLOGY**	**COMMENTS**
Olivine	5	79	2-5	Equant	Fresh.
Orthopyroxene	0.5	20	2-8	Anhedral	
Clinopyroxene	?	1-2	<0.5	Interstitial	At orthopyroxene borders.
Spinel	0.5	1	<0.5	Anhedral	

GENERAL COMMENTS

SECONDARY MINERALS	**PERCENT PRESENT**	**REPLACING**	**MORPHOLOGY**	**COMMENTS**
Serpentine	92	Olivine, orthopyroxene, clinopyroxene	Mesh and ribbon textures	Cross-fiber length-fast serpentine in the rims of the mesh and ribbon textures. Bastite pseudomorph after orthopyroxene.
Magnetite	1	Olivine	Subhedral	Core of the mesh textures and intergrown with cross-fiber serpentine in the rims.
Clays	1	Olivine		

VEIN / FRACTURE FILLING	**PERCENT PRESENT**	**MORPHOLOGY**	**COMMENTS**
Chrysotile veins		Straight and irregular	Composite veins with length fast serpentine (lizardite).

STRUCTURE

Crystal Plastic:
Very minor ductile deformation; kink banding of pyroxene and undulose extinction in remnant olivine.

Brittle:
None visible in thin section.

Foliation:
Weak foliation defined by ribbon texture serpentine.

Crosscutting Relationships (as are apparent in thin section):
1) Minor ductile deformation
2) Serpentinization
3) Serpentine veins