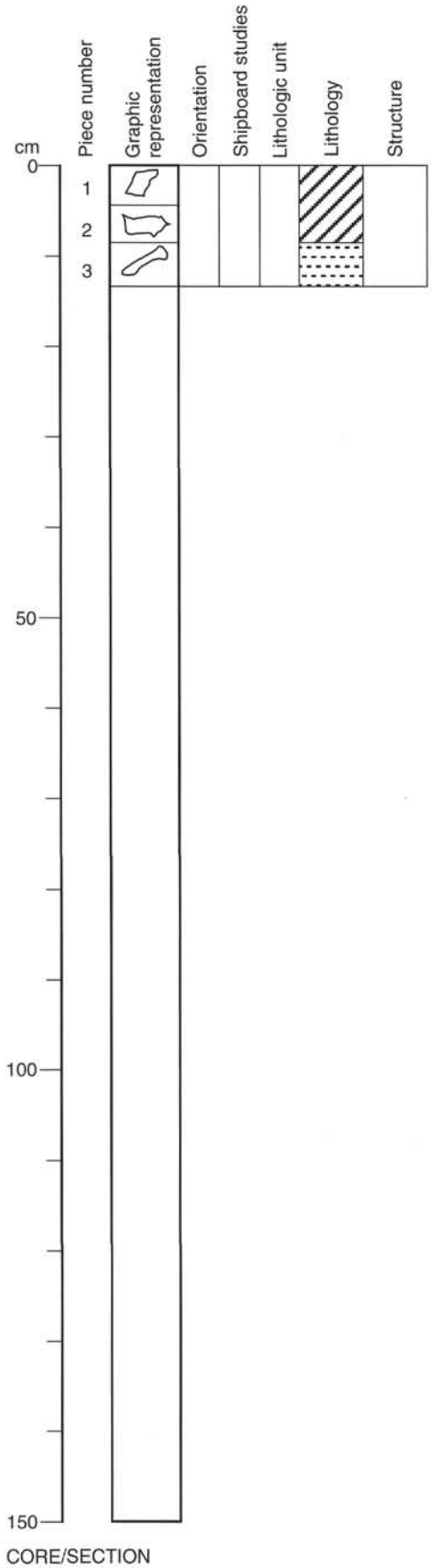
Information on Core Description Forms, for ALL sites, represents field notes taken aboard ship. Some of this information has been refined in accord with post-cruise findings, but production schedules prohibit definitive correlation of these forms with subsequent findings. Thus, the reader should be alerted to the occasional ambiguity or discrepancy in this unedited material.

158-957A-1X-1



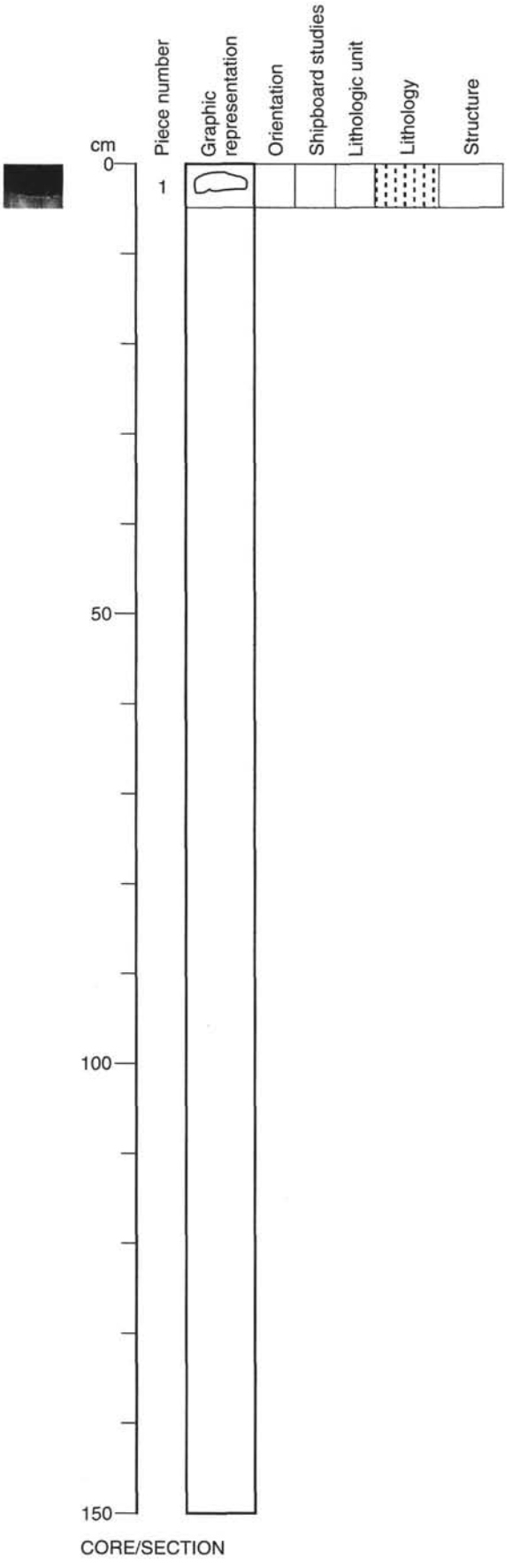
Pieces 1 and 2

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None apparent.
COLOR: Dark gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Piece 1—Pyrite, 100%, fine-grained, granular to colloform, featureless.
Piece 2—Pyrite, 90%, fine-grained, granular to colloform, featureless.
Chalcopyrite, 10%.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
None visible in hand specimen.
TRACE MINERALS (<2%):
Name, Included in, Characteristics
Piece 1—Sphalerite.
Amorphous silica visible under magnification, 1%.
TEXTURAL DESCRIPTION: Porous, granular to colloform, up to 30% pore space.
VEINS: None apparent, structureless.
ADDITIONAL COMMENTS: Piece 2—Colloform outer rind with porous, fine-grained sulfides (pyrite ± chalcopyrite) inside the crust.

Piece 3

ROCK TYPE: RED CHERT (Type 2)
CONTACTS: None apparent.
COLOR: Red, minor brassy coating.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 45%, massive, amorphous.
Fe-oxide, 45%, massive, amorphous.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 10%, fine-grained crustiform and disseminated euhedra.
TEXTURAL DESCRIPTION: Cherty Fe-oxides with remnant porosity of about 10%.
VEINS: None apparent, structureless.
ADDITIONAL COMMENTS: Crustiform, fine-grained pyrite with interior oxidized to amorphous Fe-oxide minerals and cemented by amorphous silica. Disseminated pyrite euhedra (1 mm) locally appear to be secondary growths or relict grains.

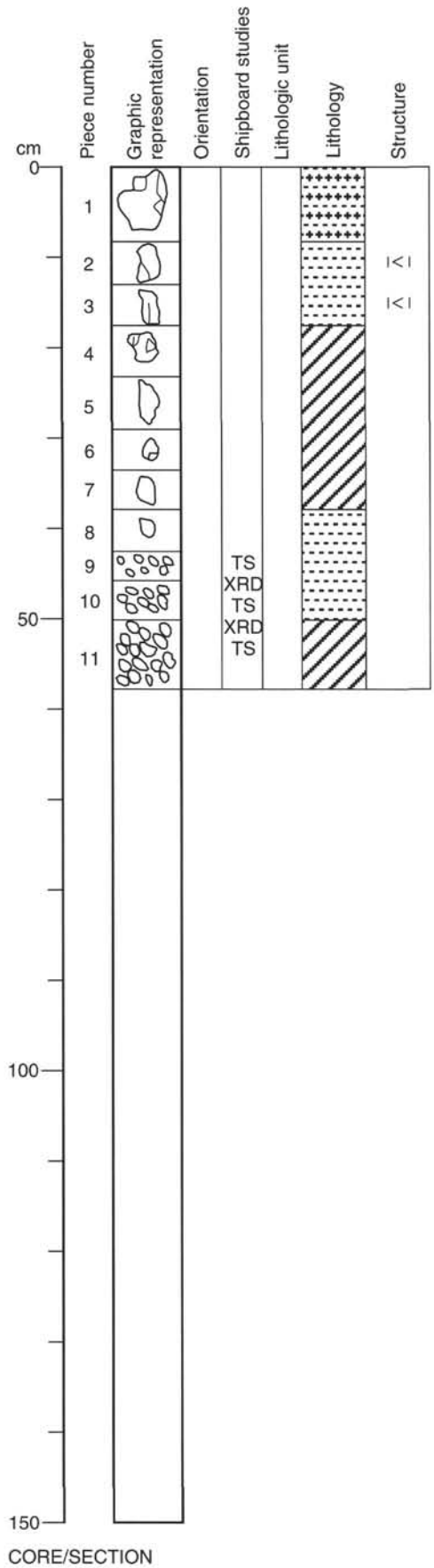
158-957A-2X-1



Piece 1

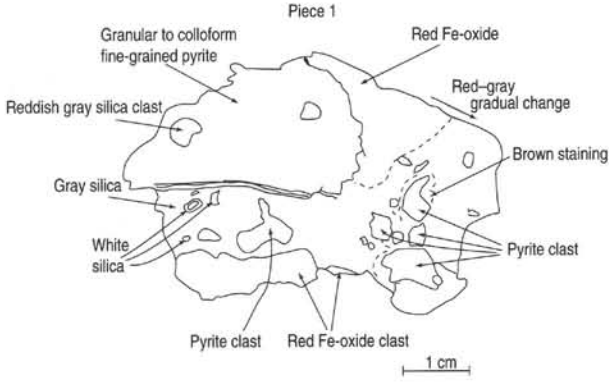
ROCK TYPE: Fe-OXIDE (Type 1)
CONTACTS: None.
COLOR: Red, with gray outer band.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Red: amorphous Fe-oxide 50%.
Gray: silica with some pyrite grains, 50%.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite disseminated in gray silica.
TEXTURAL DESCRIPTION:
Red: finely porous Fe-oxide.
Gray: massive silica, very fine-grained.
Porosity as high as 10%.

158-957A-3X-1



Piece 1

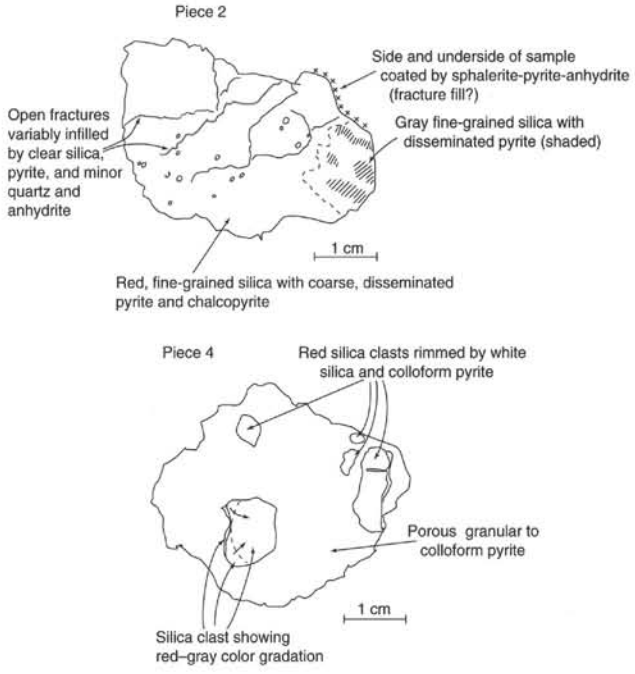
ROCK TYPE: CHERT-SULFIDE BRECCIA (Type 4)
CONTACTS: None.
COLOR: Yellow, red, dark gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Yellow: pyrite, 50%, fine-grained, granular to colloform.
Red: Fe-oxide, 15%, amorphous, earthy.
Gray: silica, 35%, massive, amorphous.
Red: silica, 10%, massive, amorphous, transitional between Fe-oxide and gray silica, also as clasts 2 cm to 2 mm.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz(?).
TRACE MINERALS:
Name, Included in, Characteristics
Chalcopyrite, pyrite, euhedral.
Sphalerite, pyrite, associated with chalcopyrite.
TEXTURAL DESCRIPTION: Finely porous (porosity up to 15%).
VEINS:
Size: >3- to ~0.5-cm-clasts.
Orientation: irregular clasts of porous massive pyrite.
Minerals: enclosed in silica and Fe-oxide.
ADDITIONAL COMMENTS: Massive pyrite pieces also contain fragments of silica and Fe-oxide (<5 mm), including material similar to that described in Piece 8 (this section). See sketch for textural relations.



Pieces 2, 3, 9

ROCK TYPE: RED CHERT (Type 2)
CONTACTS: None.
COLOR: Red.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 40%, euhedral, disseminated and fracture filling.
Red silica, 40%, massive matrix.
Gray silica, 5%, massive, gradational from red silica.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, disseminated in silica (especially gray type) or associated with sphalerite.
Anhydrite, 2%, disseminated with sulfides in fractures.
Sphalerite, 1%, late overgrowth in voids and open fractures.
TRACE MINERALS (<2%):
Name, Included in, Characteristics
Quartz, overgrowth, euhedral.
TEXTURAL DESCRIPTION: Massive, fine-grained silica with disseminated sulfides. Porosity 5%.
VEINS:
Size: <0.2- to 2-mm fractures.
Orientation: irregular network in red silica.
Minerals: variably infilled by clear silica, fine granular pyrite, and quartz.
ADDITIONAL COMMENTS: A second fracture type (seen to bound outer parts of piece) lined by fine pyrite and sphalerite with coarse anhydrite.

158-957A-3X-1



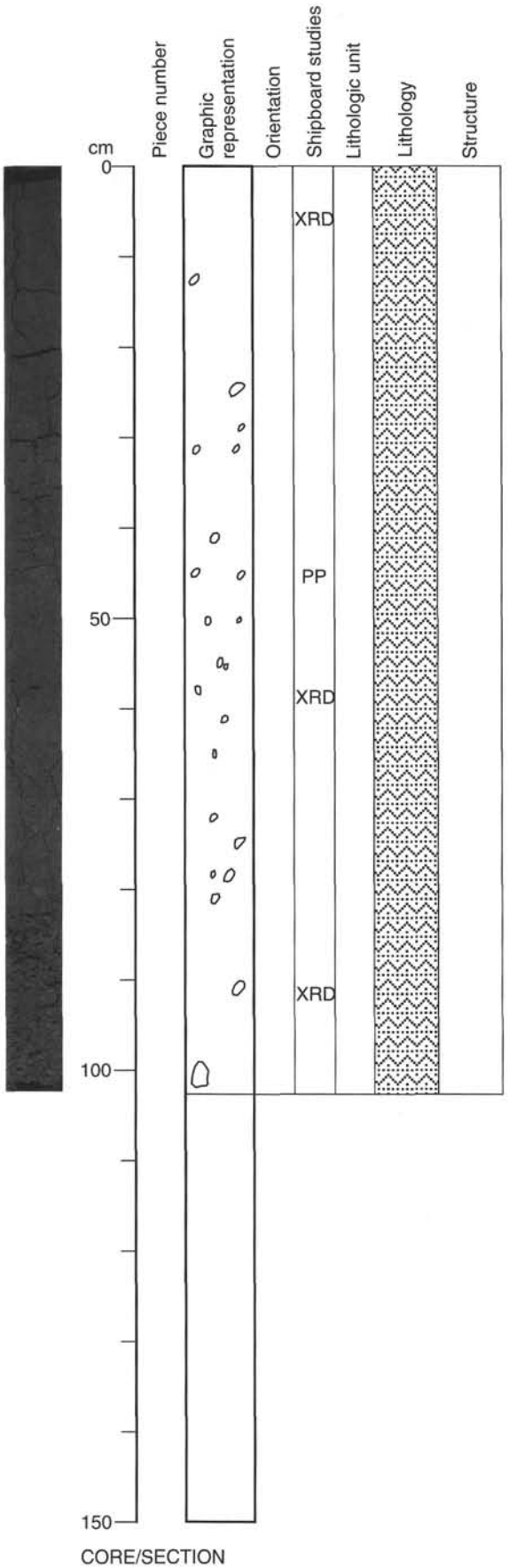
Pieces 4–7 and 11

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Gray-green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, granular, euhedral and colloform.
Red silica clasts in Pieces 4, 6, 9–11.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Red silica, 3%, mm- to cm-sized clasts in pyrite.
Sphalerite, 2%, as a late mineral in coarse open spaces.
TEXTURAL DESCRIPTION: Porous, granular to colloform. Porosity as high as 25%.
ADDITIONAL COMMENTS: Red clasts—some are subrounded, some are angular (see sketch of Piece 4).
Piece 11 includes fragments of porous massive sphalerite.

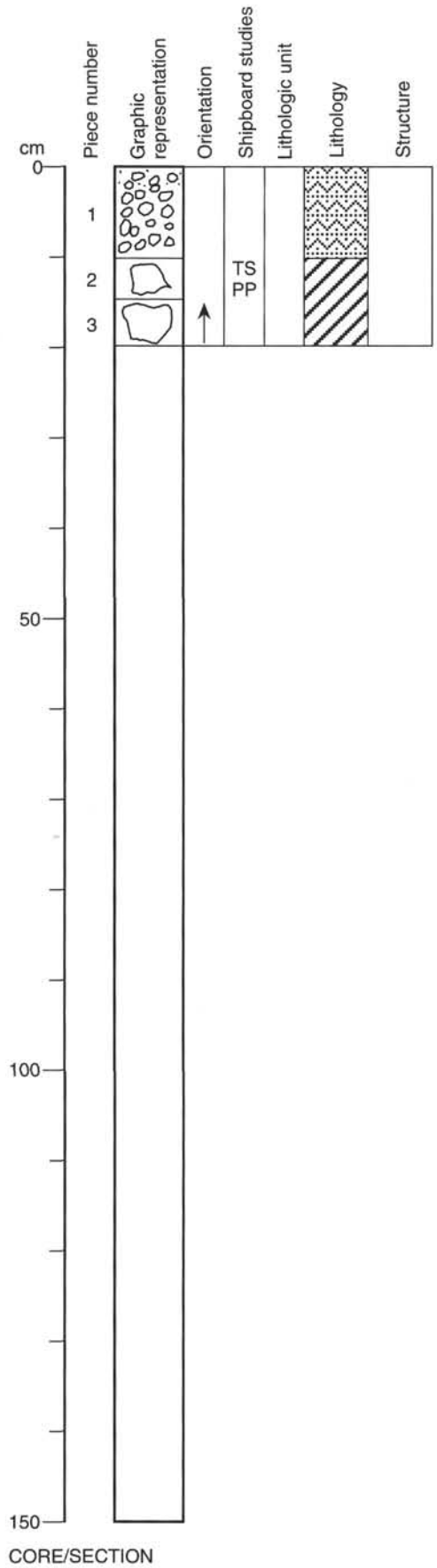
Piece 8 and 10

ROCK TYPE: GRAY SILICA (Type 3)
CONTACTS: None.
COLOR: Light gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 99%, very fine-grained, cryptocrystalline.
TRACE MINERALS (<2 %):
Name, Size, Included in, Characteristics
Pyrite, silica.
TEXTURAL DESCRIPTION: Very fine-grained silica. Porosity 15%.

158-957B-1R-1



ROCK TYPE: DRILL CUTTINGS, FINE
CONTACTS: None.
COLOR: Red brown to dark brown.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Fe-oxides, 60%–70%, fine sand, coarse sand, fragments, clasts.
Iron sulfides, 20% (maximum), fine sand, clasts up to 2 cm.
Siliceous fragments, 10%–20%, fine sand, clasts up to 2 cm.
Fine siliceous sand, 10%–20%, fine matrix or mud visible under magnification.
TRACE MINERALS (<2%):
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, as fine, disseminated grains in sand.
Jarosite(?).
TEXTURAL DESCRIPTION: Core cuttings, probable ground fragments of red, cherty sulfide.
ADDITIONAL COMMENTS: Fe-oxide fragments are variably silicified, many red fragments are pure, unlithified Fe-oxides. Fine sand- to gravel-sized fragments.



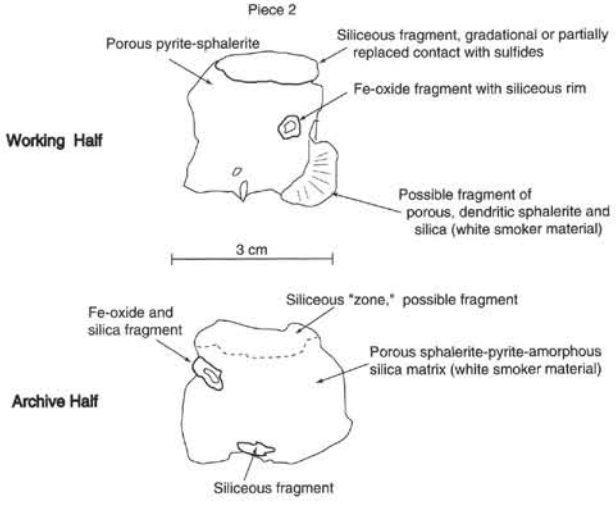
158-957B-1R-2

Piece 1

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Red brown.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Fe-oxides, 65%, fine to medium sand- and pebble-sized fragments and clasts.
Gray chert, 15%, fine to medium sand- and pebble-sized fragments and clasts.
Red chert, 15%, fine to medium sand- and pebble-sized fragments and clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, fine-grained clasts, single grains.
TEXTURAL DESCRIPTION: Drill cuttings.
ADDITIONAL COMMENTS: Continuation from base of Section 158-957B-1R-1

Piece 2

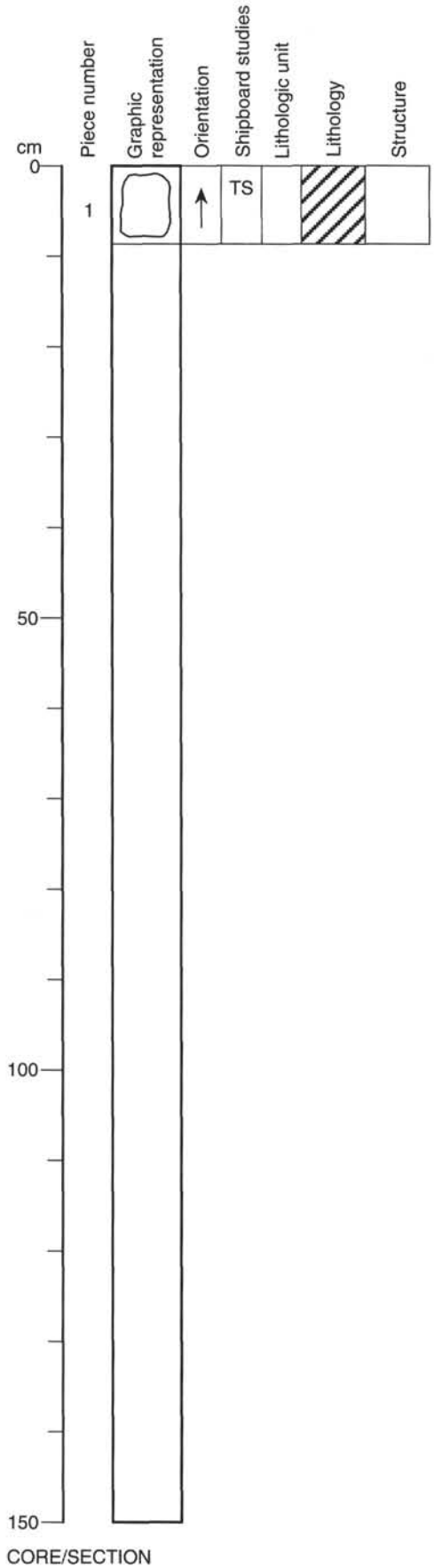
ROCK TYPE: POROUS MASSIVE SPHALERITE (Type 5b)
CONTACTS: None.
COLOR: Dark gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 10%, very fine-grained, porous, dendritic, colloform.
Sphalerite, 55%, very fine-grained, porous, dendritic, colloform, globular.
Silica, 30%, very fine-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Fe-oxides, 5%, very fine-grained, with amorphous silica as breccia fragments.
TRACE MINERALS (<2%):
Name, Included in, Characteristics
Chalcopyrite, associated with coarse sphalerite lining voids.
TEXTURAL DESCRIPTION: Matrix dominated (fragments 20%, matrix 80%) fragments of red and gray chert cemented by white smoker material. Breccia fragments 0.5 to 2.5 cm.
ADDITIONAL COMMENTS: Silica as chert clasts. Evidence of tube structure (see sketches).



Piece 3

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, medium to coarse euhedral grains.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%.
TRACE MINERALS (<2%):
Name, Included in, Characteristics
Silica.
TEXTURAL DESCRIPTION: Massive pyritic sulfide. Porosity 10%.

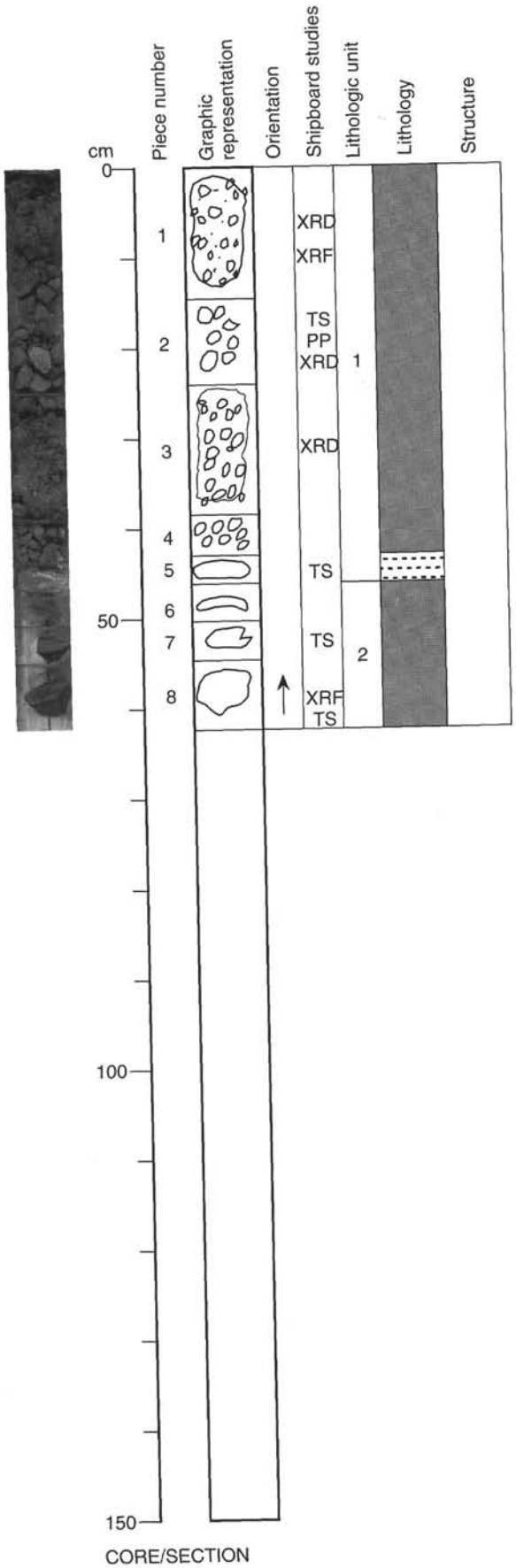
158-957B-3R-1



Piece 1

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy green yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine- to coarse-grained massive, granular, anhedral to euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, disseminated.
Silica, 3%, amorphous, void filling.
TEXTURAL DESCRIPTION: Massive, granular, fine- to coarse-grained. Porosity 5%.
ADDITIONAL COMMENTS: Coarser than the massive sulfide in Section 158-957B-1R-2, some grains to 5 mm. Sample appears to be a breccia. "Clasts" of fine- to medium-grained pyrite are surrounded by more porous areas of pyrite.

158-957B-4R-1

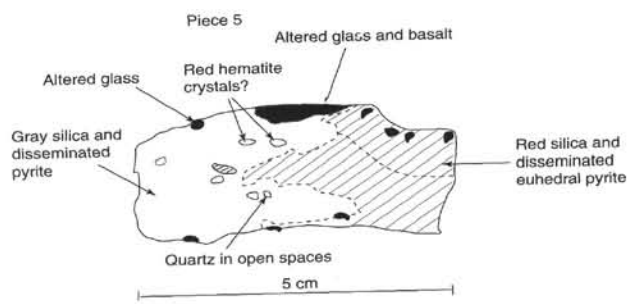


Pieces 1–4

UNIT 1: SPARSELY OLIVINE PHYRIC BASALT PILLOW RIM BRECCIA
CONTACTS: None observed.
PHENOCRYSTS:
Olivine, 3%, 0.5 mm, euhedral grains.
GROUNDMASS: Glassy to microcrystalline with plagioclase microlites.
VESICLES: 2%.
COLOR: Brownish gray.
ALTERATION: 100% alteration of basalt and glass to chlorite.
ADDITIONAL COMMENTS: Interpillow breccia fragments in mud.

Piece 5

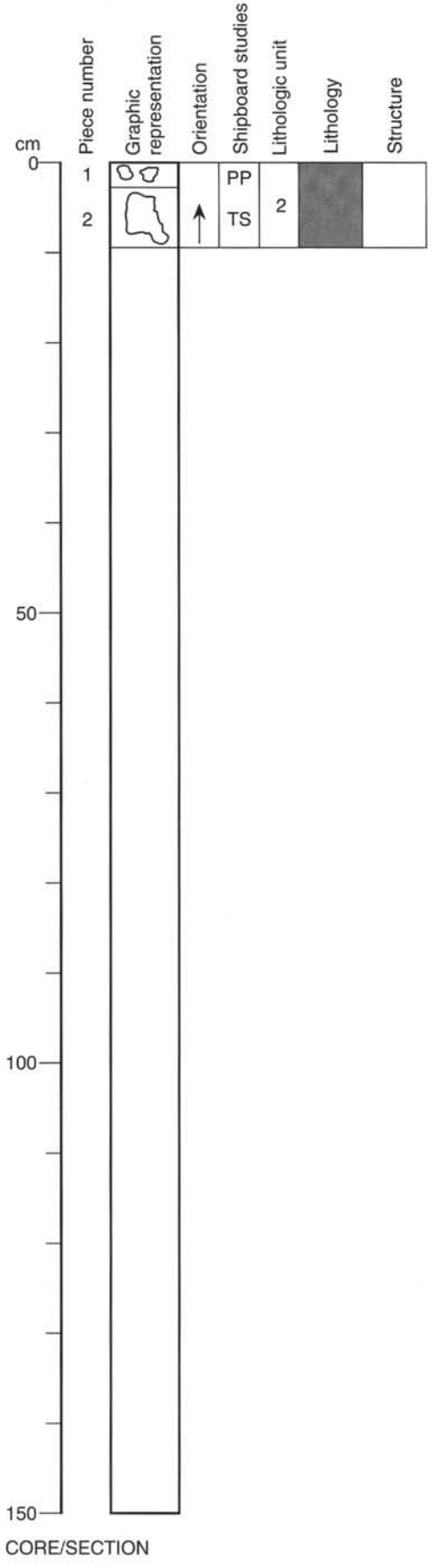
ROCK TYPE: RED AND GRAY CHERT (Type 2, 3)
CONTACTS: None observed.
COLOR: Red and gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 98%, cryptocrystalline, stained red by Fe-oxides.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 2%, very fine-grained, in silica, disseminated.
Fe-oxide patches, variously silicified.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Quartz.
TEXTURAL DESCRIPTION: Porosity 3%, small (<1 mm) voids.
ADDITIONAL COMMENTS: Contains altered glass fragments (0.5–5.0 mm) now as chlorite. For detailed textural relations see sketch. From interval containing altered pillow rim breccia and metalliferous hydrothermal clays.



Pieces 6–8

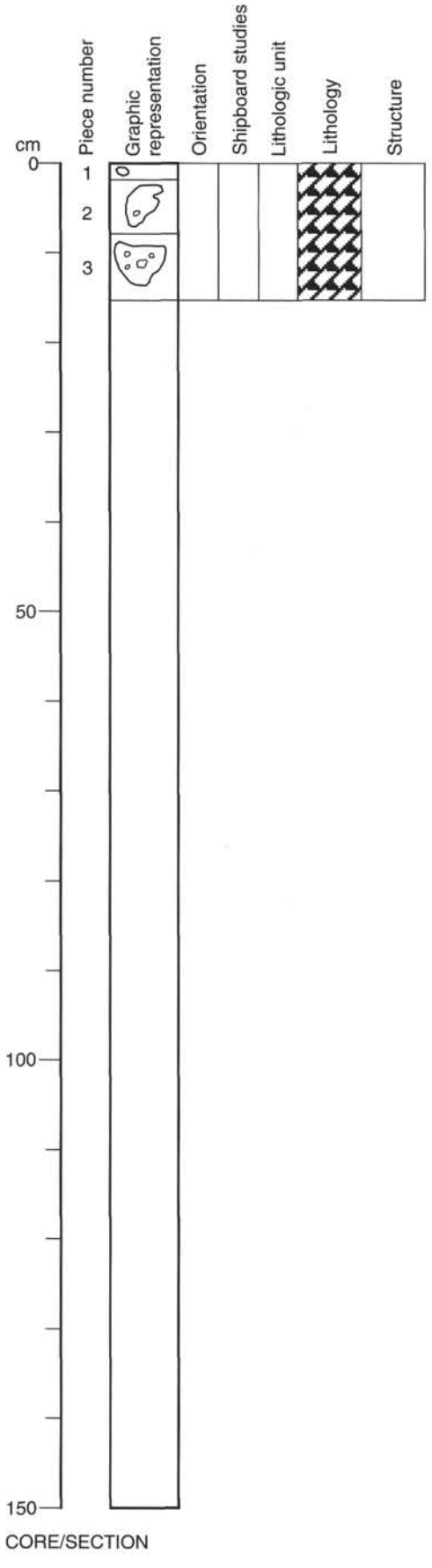
UNIT 2: APHYRIC BASALT
CONTACTS: None observed.
PHENOCRYSTS:
Olivine, 1%, 0.5 mm, euhedral grains.
GROUNDMASS: Microcrystalline with plagioclase microlites.
VESICLES: 2%; Filled with smectite.
COLOR: Reddish brown to dark gray.
ALTERATION: 7%–15% alteration of basalt to smectite.

158-957B-5B-1



Pieces 1 and 2

UNIT 2: APHYRIC BASALT
CONTACTS: None observed.
PHENOCRYSTS: ?
GROUNDMASS: Microcrystalline with plagioclase microlites.
VESICLES: 2%; filled with smectite.
COLOR: Reddish gray.
ALTERATION: 100% of basalt to chlorite and smectite.



158-957C-4W-1

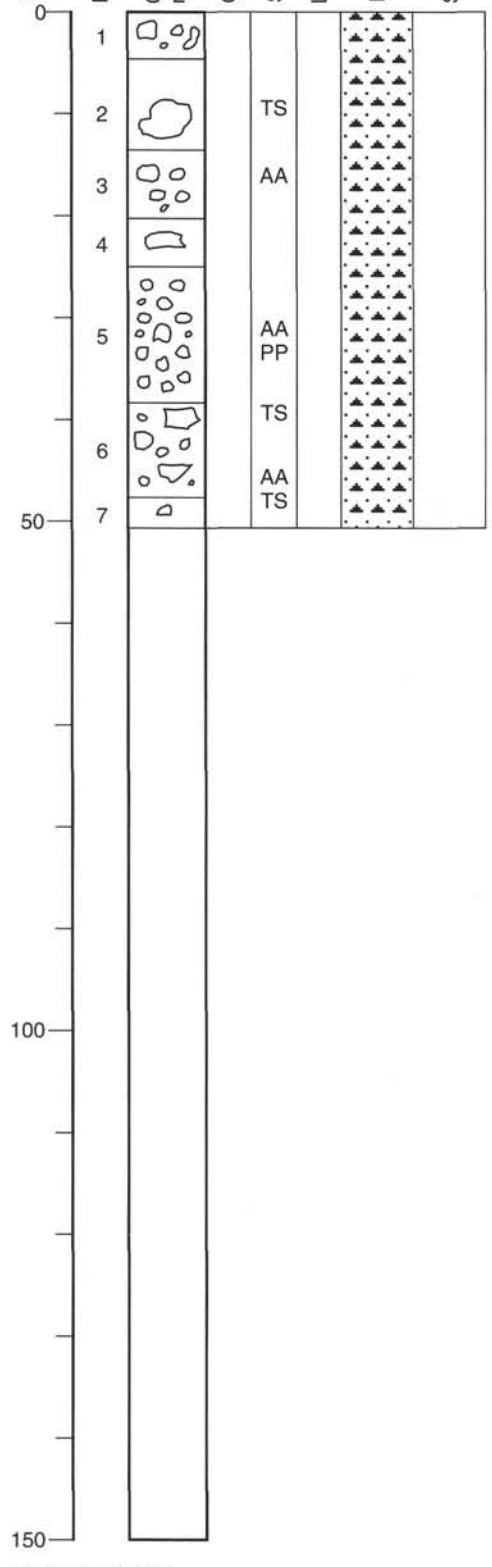
Pieces 1–3

ROCK TYPE: POROUS NODULAR PYRITE BRECCIA (Type 6a)
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, very fine to medium-grained, euhedral.
Anhydrite, 25%, fine-grained, euhedral.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, associated with pyrite.
TEXTURAL DESCRIPTION: Conglomerate; pyrite sand and gravel cemented by anhydrite. Pyrite varies from individual crystals (<0.5 to 2 mm) to subrounded clasts (1 to 10 mm). Porosity 15%–20%.
VEINS:
Size: <2-mm-wide veins.
Orientation: Irregular.
Minerals: Fine-grained anhydrite.
ADDITIONAL COMMENTS: Similar to pyrite-rich, massive anhydrite recovered from mound surface by submersible.

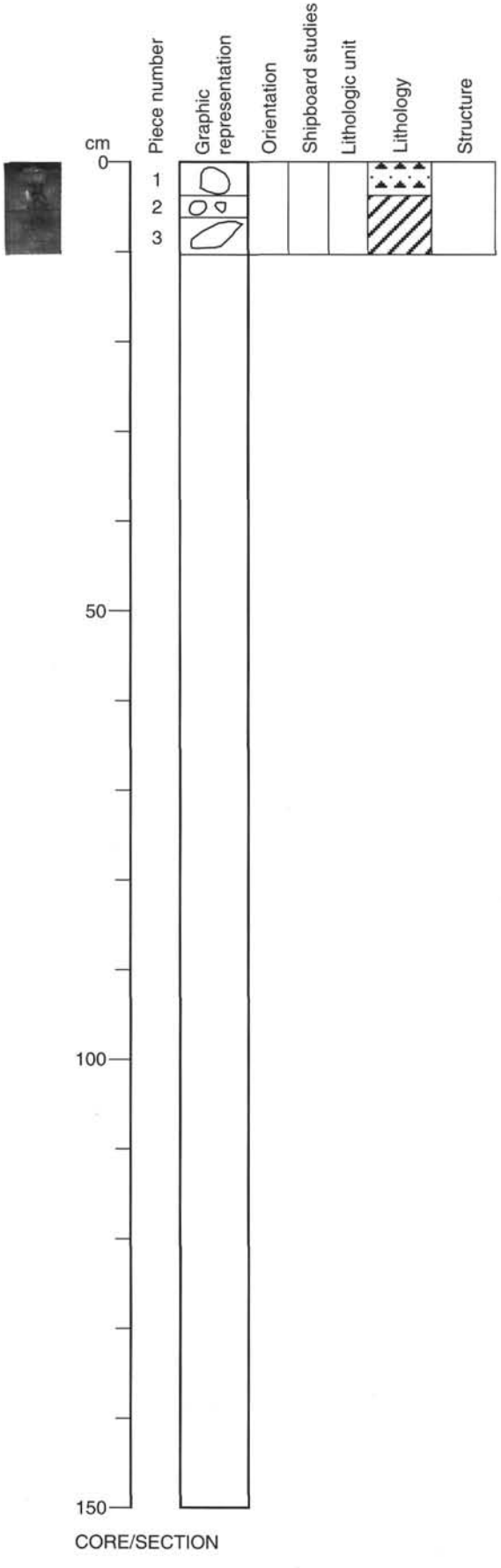
158-957C-5N-1

Pieces 1–7

ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Brassy gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%–95%, fine- to very coarse-grained, subangular to nodular clasts.
Anhydrite, 5%–20%, medium- to coarse-grained, euhedral, rosettes.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, <2%–5%, fine-grained, lining pyrite clasts and intergrown with pyrite.
TRACE MINERALS:
Name, Size, Included in, Characteristics
Silica, fine to very fine-grained, in cavities
TEXTURAL DESCRIPTION: Pyrite sand and gravel cemented by anhydrite, nodular, massive to granular, some pieces are porous. Porosity <5%–10%.
ADDITIONAL COMMENTS: Pieces 1 and 2 are similar to surface samples and contain relatively abundant anhydrite (15%–20%) as cement and within pyrite clasts. Piece 3 shows drill marks. Pieces 3–7 are more pyrite-rich (90%–95%). Piece 3 is recrystallized. Sulfides in Piece 7 are tarnished.



CORE/SECTION



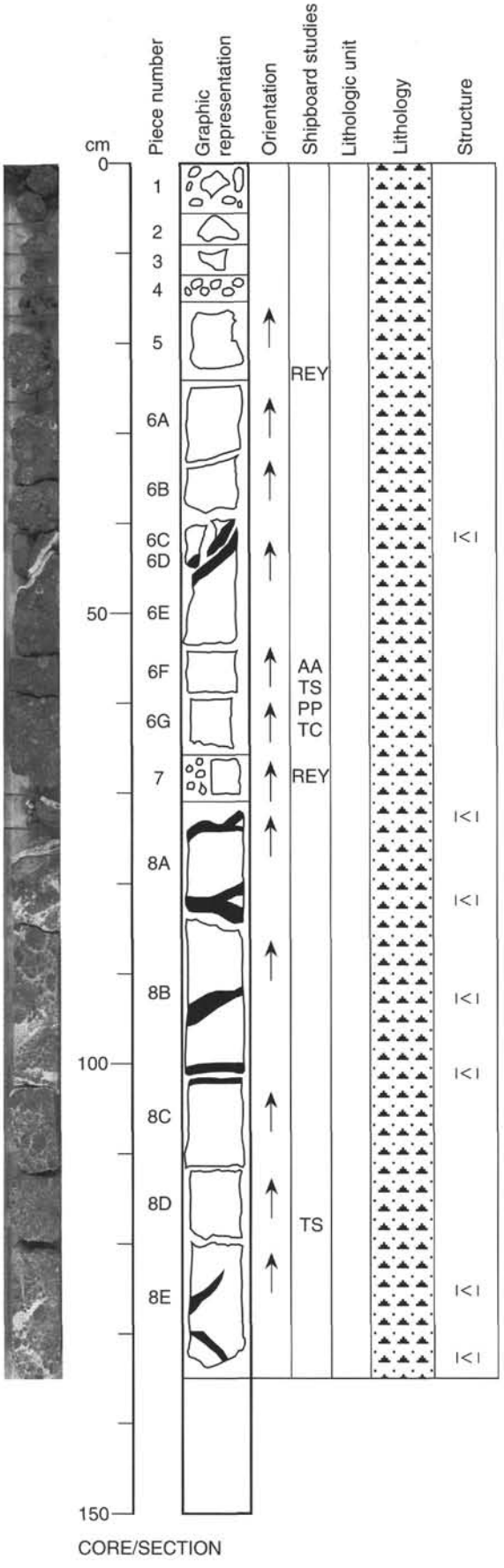
158-957C-6W-1

Piece 1

ROCK TYPE: PYRITE-ANHYDRITE BRECCIA (Type 7)
CONTACTS: None.
COLOR: White to brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, medium-grained, euhedral aggregates
Anhydrite, 50%, coarse-grained, aggregates, rosettes.
TEXTURAL DESCRIPTION: Disseminated, granular aggregates of euhedral pyrite in massive anhydrite matrix. Porosity 2%.
ADDITIONAL COMMENTS: Matrix-supported, porosity virtually absent.

Pieces 2–3

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine to medium-grained, commonly euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine to medium-grained, infilling fine porosity, acicular grains.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, infilling porosity, rare quartz crystals.
Chalcopyrite, intergrown with pyrite, few crystals line porosity.
TEXTURAL DESCRIPTION: Massive, granular. Porosity 2%.
ADDITIONAL COMMENTS: Probable breccia clast.



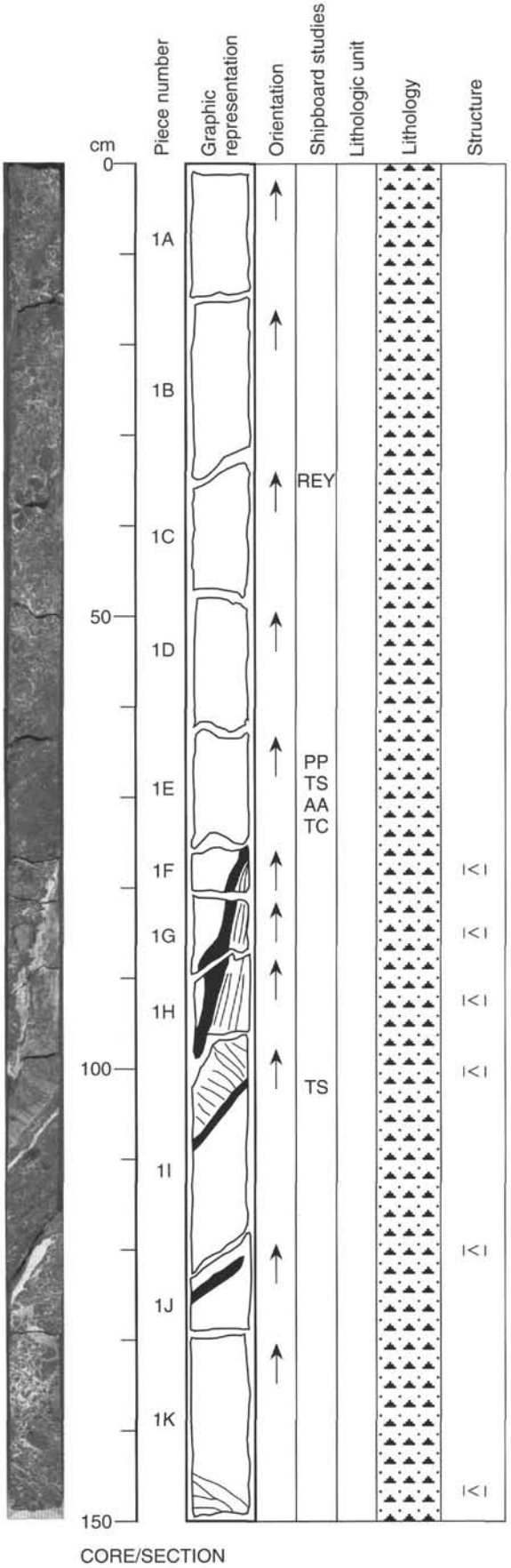
158-957C-7N-1

Pieces 1–7

ROCK TYPE: NODULAR SILICEOUS PYRITE-ANHYDRITE BRECCIA (Type 7c)
CONTACTS: 73 cm, white crustiform anhydrite vein.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, nodular aggregates up to 2 cm in diameter and pyrite sand in anhydrite matrix.
Anhydrite, 10%, medium-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%.
Chalcopyrite, 5%, fine-grained, appears in clasts (Type 2) and in anhydrite-pyrite matrix.
TRACE MINERALS (<2%):
Name, Abundance (%), Included in, Characteristics
Fe-oxide, clast in Piece 6A.
TEXTURAL DESCRIPTION: Nodular pyrite in anhydrite matrix. Porosity 5%.
VEINS:
Size: 12-mm-thick vein in Pieces 6C, 6D, and 6E.
Orientation: 45°
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Pyrite clasts are very fine- to fine-grained with chalcopyrite or a combination of very fine-grained pyrite with tiny pyrite clasts up to 1 mm in diameter. 90% of pyrite is in nodules, 10% is very fine-grained in anhydrite matrix. Piece 6 contains fractured pyrite clasts with anhydrite filling the fractures.

Pieces 8A–8E

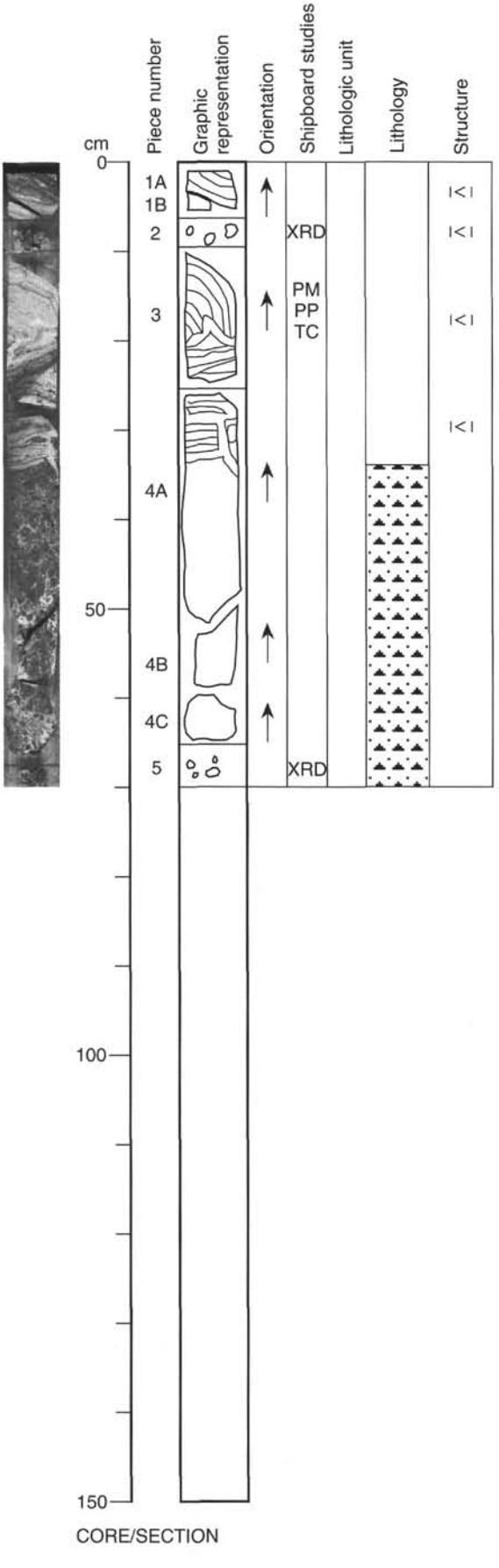
ROCK TYPE: NODULAR SILICEOUS PYRITE-ANHYDRITE BRECCIA (Type 7c)
CONTACTS: None.
COLOR: White to gray green.
MAJOR MINERALS:
Name, Abundance (%), Size Morphology, Characteristics
Pyrite, 45%, fine-grained, as dust in anhydrite matrix, 3% medium-grained, in different clasts. See list in additional comments.
Anhydrite, 42%, medium- to coarse-grained, as clasts and matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Gray chert, 8%, very fine-grained.
Chalcopyrite, 2%, fine-grained, intergrown with pyrite or as clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Quartz, very fine-grained, as euhedral crystals in cavities.
TEXTURAL DESCRIPTION: Nodular. Porosity 2%.
VEINS:
Size: 5-mm-thick veins.
Orientation: One at 17° (74 cm), one at 5° (102 cm).
Minerals: Anhydrite
ADDITIONAL COMMENTS: Matrix supported. Two anhydrite vein generations. An early, weakly banded set cut by a later crustiform one. Mm-scale anhydrite veins fill fractures. Clast types are all subangular to subrounded and include the following types:
1. Very fine-grained pyrite with gray quartz/chert matrix 1–3 cm. Commonly brecciated and veined or filled by anhydrite.
2. Granular massive pyrite, 0.5 to 2 cm.
3A. Massive, very fine-grained pyrite and chalcopyrite, 0.5 to 2 cm.
3B. Massive, very fine-grained pyrite, 0.5 to 2 cm.
3C. Massive, very fine-grained chalcopyrite, 0.5 to 1 cm.
4A. Red chert, 0.5 cm.
4B. Gray chert, 0.5 cm.
5. Very fine-grained pyrite in gray massive anhydrite matrix (?), 3 to 10 cm.



158-957C-7N-2

Pieces 1A–1K

ROCK TYPE: NODULAR SILICEOUS PYRITE-ANHYDRITE BRECCIA (Type 7c)
CONTACTS: Large massive anhydrite vein in Pieces 1F–1I (see additional comments).
COLOR: Mottled green gray and white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, very fine- to fine-grained, small grains, aggregates up to 3 cm.
Anhydrite, 40%, euhedral and microcrystalline, breccia matrix.
Gray chert, 9%, cementing pyrite in 0.1–1-cm clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, most common from 57 to 99 cm.
Fe-oxide, stained wallrock in Piece 1I, lower edge of vein.
TEXTURAL DESCRIPTION: Nodular. Pyrite and partly rounded pyrite clasts in anhydrite matrix. Matrix-supported clasts. Porosity 10%.
ADDITIONAL COMMENTS: Large white and gray sulfate-sulfide vein cuts subvertically across Pieces 1F to1I. Vein is comprised of 95% anhydrite, 4% pyrite, and 1% chalcopyrite (concentrated along the upper wall). Texturally this vein is massive anhydrite with local color banding from 86 to 91 cm. From 100 to 108 cm, the banding is related to pyrite abundance; coarser grains occur at the upper part of this zone. The vein cuts subvertically from 77 to 108 cm. The lower edge of the vein has ~1-cm-thick red staining on both sides of a recent 5-mm-thick vein of white anhydrite. The vein has an anhydrite and pyrite ± chalcopyrite replacement halo. The vein also contains large fragments of an earlier laminated vein.



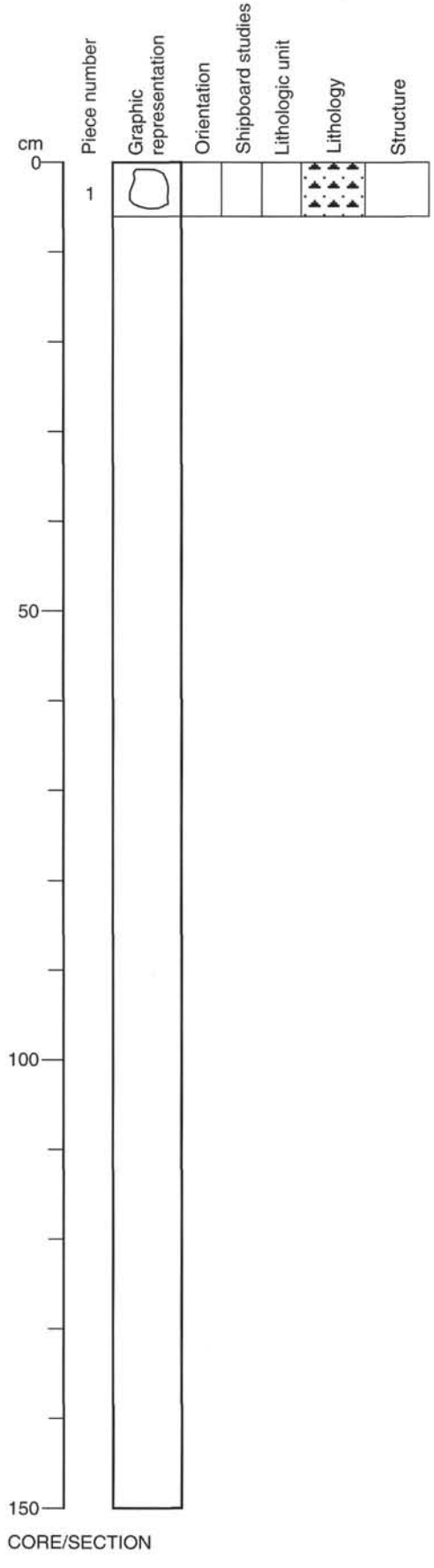
158-957C-7N-3

Pieces 1–3

ROCK TYPE: MASSIVE ANHYDRITE VEIN (Type 11)
CONTACTS: 33 cm with Piece 4A (nodular pyrite-anhydrite breccia).
COLOR: White.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 95%, medium to coarse-grained, massive, banded crustiform.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 3%, fine-grained, disseminated pyrite in anhydrite bands.
Chalcopyrite, 2%, fine-grained, disseminated with pyrite.
TEXTURAL DESCRIPTION: Multiple generations of anhydrite in 25- to 30-cm-wide anhydrite vein.
VEINS: Late fractures localize late anhydrite.
ADDITIONAL COMMENTS: Early banded anhydrite at margins of vein and filling 75% of vein. Late barren anhydrite filling fracture-controlled cavity in interior of vein. Abundant disseminated pyrite-chalcopyrite at margins of vein. Several smaller, late anhydrite barren veins cutting larger massive vein.

Pieces 4 and 5

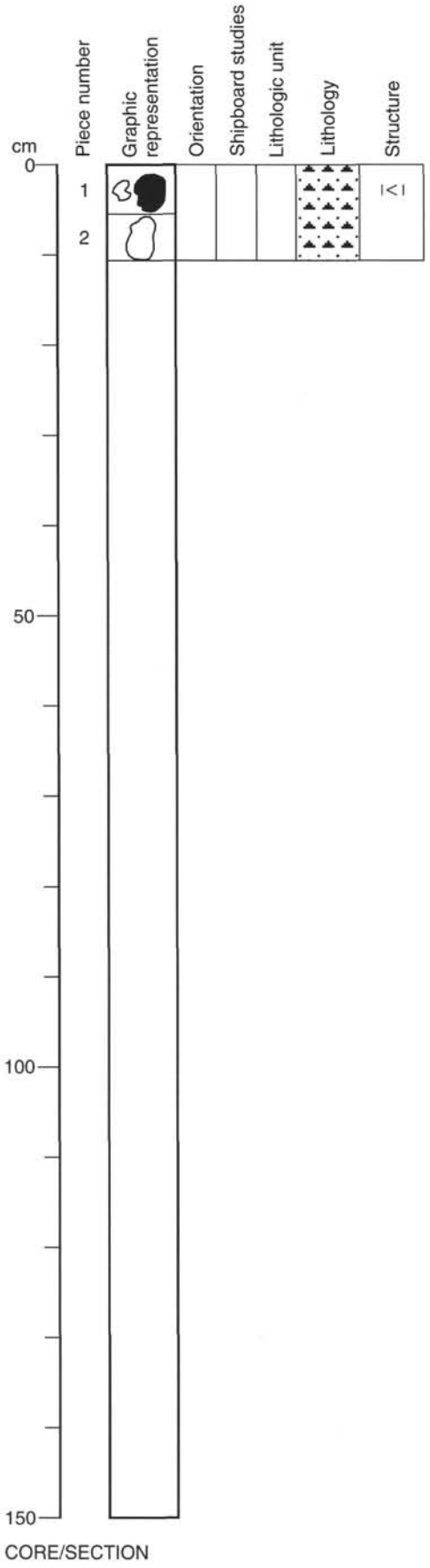
ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b)
CONTACTS: 33 cm, with large anhydrite vein (Pieces 1–3).
COLOR: White, gray, brass.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 50%, medium-grained, matrix.
Pyrite, 40%, fine- to medium-grained, nodular aggregates up to 1 cm, fine, disseminated.
Silica, 10%, very fine-grained, with anhydrite, surrounding pyrite fragments and as diffuse patches.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Altered basalt fragments, up to 5%, up to 2–3 cm in diameter, brecciated, mineralized fragments.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, within pyrite nodules and locally as late rims on pyrite nodules.
TEXTURAL DESCRIPTION: Matrix-supported breccia consisting of medium to coarse pyrite nodules in anhydrite-silica matrix. Silica forms diffuse gray zones surrounding nodular pyrite fragments.
VEINS: Contact with large anhydrite vein; both anhydrite vein and pyrite-breccia are cut by late, barren anhydrite veins (<1 cm).
ADDITIONAL COMMENTS: Several large (up to 2 cm) gray patches may be highly altered basalt fragments cut by late anhydrite and partially to completely replaced by silica. Piece 4A contains at least two and possibly three generations of anhydrite veins.



158-957C-8W-1

Piece 1

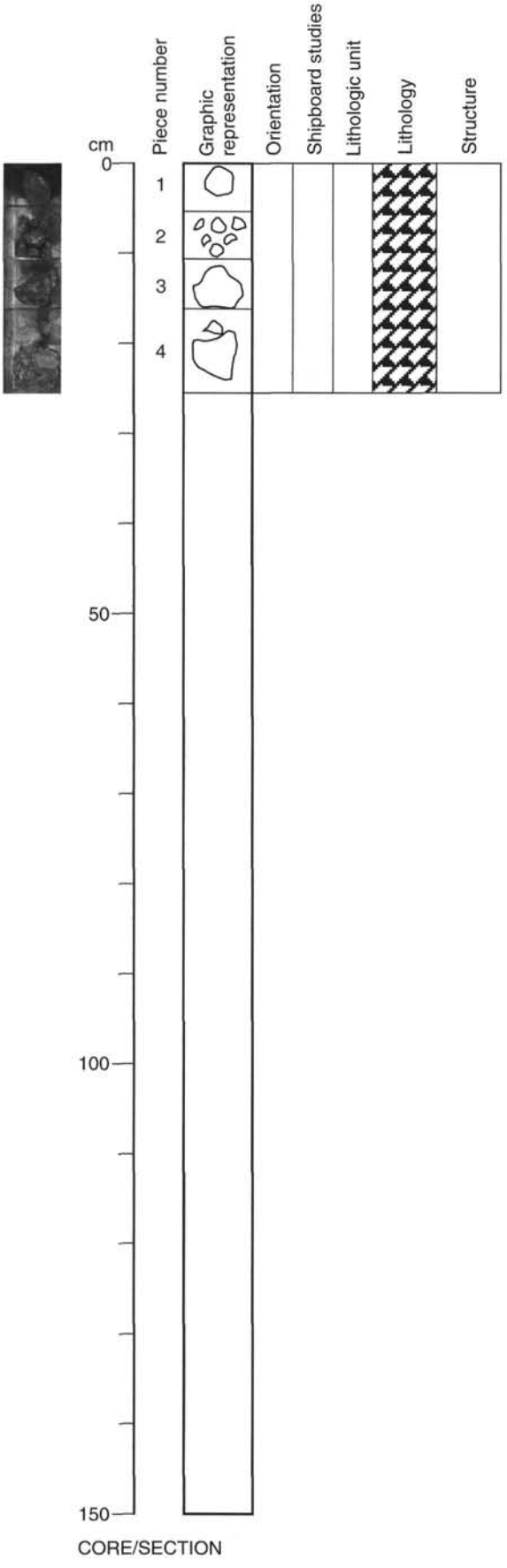
ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b)
CONTACTS: None.
COLOR: Green yellow and white to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 50%, fine-grained, euhedral.
Pyrite, 45%, very fine- to fine-grained, disseminated and clasts up to 1.5 cm.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 4%, disseminated gray silica in white anhydrite, also in pyrite clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, included in clasts and disseminated.
Sphalerite, very fine-grained, overgrowth on pyrite in void.
TEXTURAL DESCRIPTION: Matrix supported, subangular to subrounded pyrite clasts. Porosity 15%.



158-957C-9X-1

Pieces 1 and 2

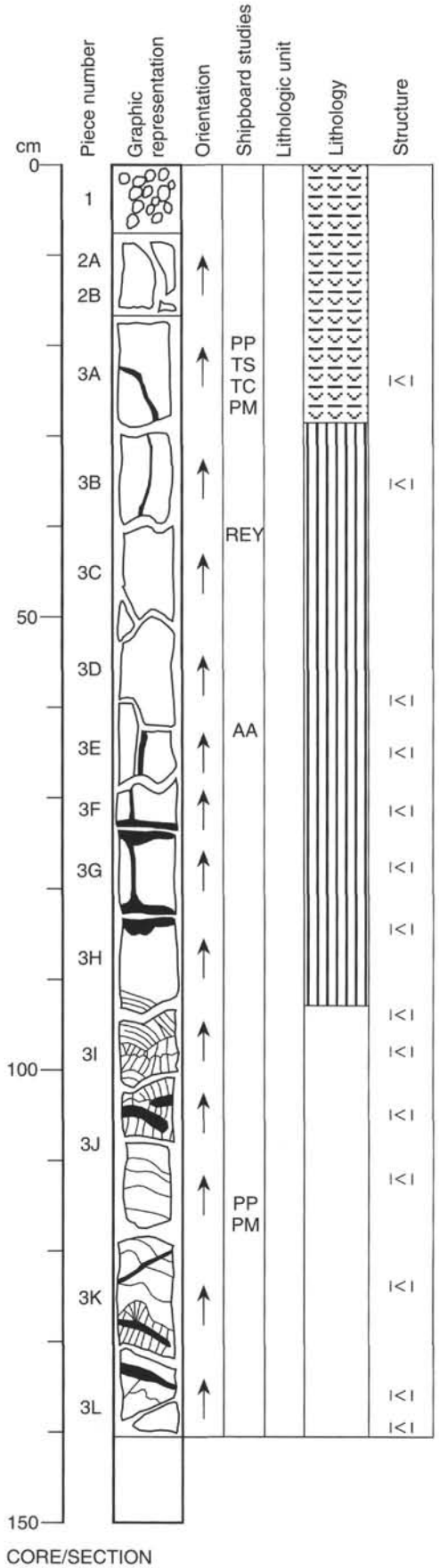
ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b)
CONTACTS: None.
COLOR: Green yellow, white, and gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, very fine- to fine-grained, disseminated and clasts up to 5 mm.
Anhydrite, 25%, fine-grained, euhedral, as breccia cement.
Silica, 15%, disseminated with anhydrite.
Chalcopyrite, 10%, very fine-grained, within and interstitial between pyrite clasts.
TEXTURAL DESCRIPTION: Clast-supported, rounded pyrite clasts. Porosity 15%.
ADDITIONAL COMMENTS: Piece 1 contains banded anhydrite vein.



158-957C-10N-1

Pieces 1–4

ROCK TYPE: MASSIVE PYRITE BRECCIA (Type 6b)
CONTACTS: None.
COLOR: Yellow gray and white to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, very fine- to medium-grained, disseminated and clasts up to 3.5 cm.
Anhydrite, 10%, fine- to medium-grained, euhedral, in matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%, disseminated and mm-sized clasts.
Chalcopyrite, 5%, rims on pyrite clasts (<1 mm).
TEXTURAL DESCRIPTION: Clast-supported breccia. Porosity 10%.
ADDITIONAL COMMENTS: Probable clasts.



CORE/SECTION

158-957C-11N-1

Pieces 1–3A

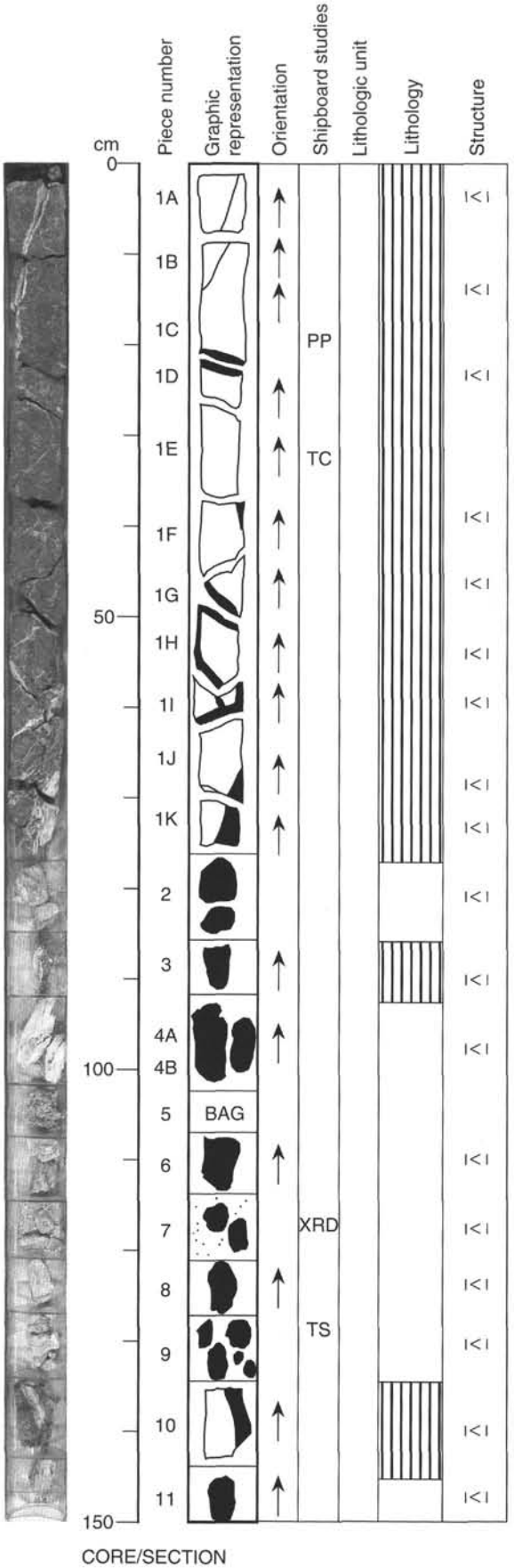
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: At 30 cm in Piece 3A, with pyrite-silica-anhydrite breccia.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica 60%, massive cement.
Pyrite 30%, disseminated.
Anhydrite 10%, fine-grained, disseminated and 1-mm veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite.
TEXTURAL DESCRIPTION: Massive. Porosity 5%.
VEINS: 1-mm anhydrite veins.
ADDITIONAL COMMENTS: Most of the pyrite occurs as very fine- to fine-grained disseminations in silica. Clasts are rounded and coarse in size (to 4 mm).

Pieces 3B–3H (90–92 cm)

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
CONTACTS: Top at 30 cm, sharp. Bottom at 92 cm, sharp.
COLOR: Green yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite 75%, very fine-grained, subrounded pyrite and silica clasts.
Chalcopyrite 10%, fine-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite 8%, disseminated in silica and in veins.
Silica 7%, cementing pyrite in clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, clast in pyrite.
TEXTURAL DESCRIPTION: Clast-supported breccia. Fine- to medium-sized clasts. Porosity 10%.
VEINS: 2- to 5-mm anhydrite veins.
ADDITIONAL COMMENTS: Chalcopyrite tends to be concentrated in wallrock around anhydrite veins. One small Fe-oxide clast. Anhydrite is localized in mm-scale fractures and has not penetrated into the surrounding rock.

Pieces: 3H (>92 cm)–3L

ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: Top at 95 cm, sharp.
COLOR: White.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 98%, medium-grained, euhedral, banded.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, at the center of anhydrite-filled open spaces.
Pyrite, 4-cm clast in Piece 3L, and disseminated in gray bands in anhydrite.
Fe-oxide, disseminated in anhydrite at 130 cm, locally in bands in anhydrite.
TEXTURAL DESCRIPTION: Banded, veins, crustiform. Porosity 10%; cm-size dissolution vugs in Pieces 3I–3L.
VEINS: 1- to 7-mm anhydrite veins.
ADDITIONAL COMMENTS: Banded anhydrite fills open spaces. Multiple generations of crosscutting anhydrite veins with brecciated-banded anhydrite clasts.



CORE/SECTION

158-957C-11N-2

Pieces 1A–1D, 1J, 1K, 3, and 10

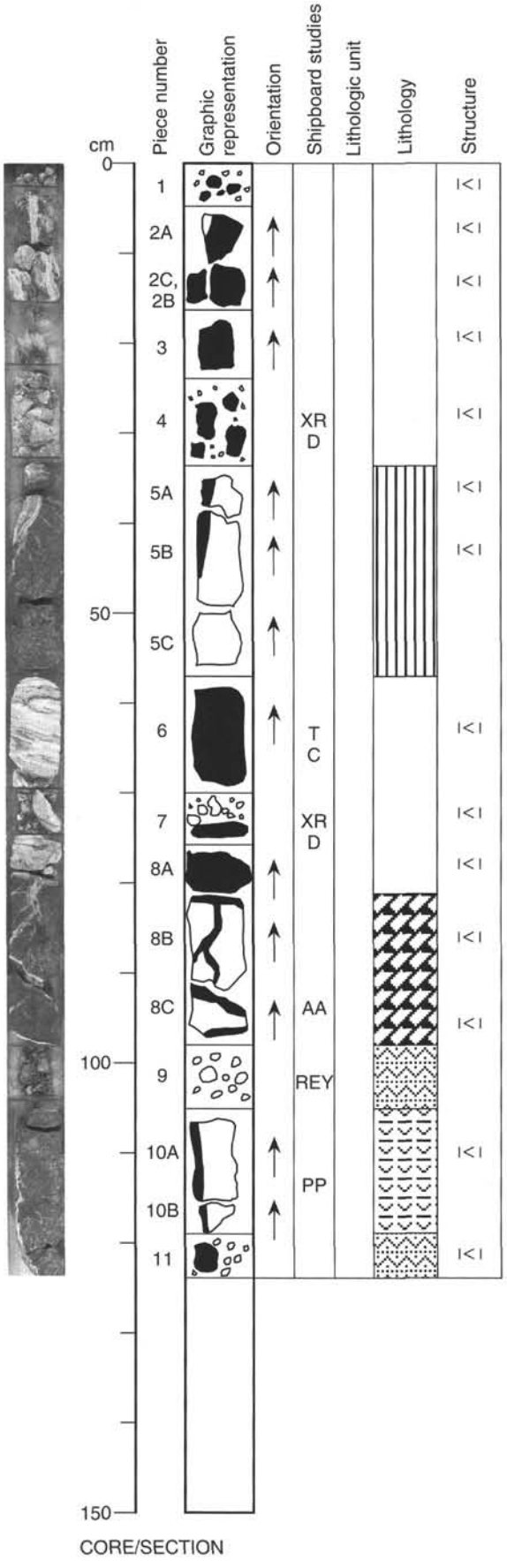
ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
CONTACTS: Anhydrite vein in Pieces 1J, 1K, and 10.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 45%, fine- to medium-grained, in pyrite-silica clasts.
Silica, 30%, very fine-grained, in pyrite-silica clasts.
Chalcopyrite, 15%, fine- to medium-grained.
MINOR MINERALS:
Name, Abundance (%), Included in, Characteristics
Anhydrite, 10%, fine- to medium-grained, in veins, crustiform, dissolution.
TEXTURAL DESCRIPTION: Breccia, clastic. Porosity 5%.
VEINS: Hydraulic fractures.
ADDITIONAL COMMENTS: Chalcopyrite enriched along selvage, pyrrhotite(?) in Pieces 1J and 1K. Anhydrite veins in Pieces 1H to 1K containing angular clasts of siliceous wallrock possibly provide evidence of hydraulic fracturing. Pieces 1A to 1C indicate a relationship between mm-scale fracturing and development of the anhydrite, pyrite, and chalcopyrite alteration halo.

Pieces 1E–1I

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA, VEINED (Type 8)
CONTACTS: None.
COLOR: Brassy yellow to gray and white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 55%, fine- to medium-grained, nodular.
Silica, 30%, very fine-grained, pyrite-silica clasts, nodular, massive.
Anhydrite, 13%, fine- to medium-grained, crosscutting veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine- to fine-grained, see below.
Red chert, very fine-grained, single clast.
TEXTURAL DESCRIPTION: Semi-massive, clastic, nodular. Porosity 5%.
ADDITIONAL COMMENTS: Chalcopyrite enriched along selvage.

Pieces 2, 4–9, and 11

ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: None observed.
COLOR: Gray to white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 95%, fine- to medium-grained, fibrous.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, very fine- to fine-grained, enriched in bands.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine- to fine-grained, enriched in bands.
TEXTURAL DESCRIPTION: Crustiform, banded. Porosity 5%.



158-957C-11N-3

Pieces 1–4 and 6–8A

ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: With sulfide breccia.
COLOR: White.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 95%, fine- to coarse-grained, crustiform.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, fine-grained, enriched in bands.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, intergrown with pyrite.
Hematite, enriched in bands.
TEXTURAL DESCRIPTION: Massive, banded, crustiform. Porosity ~2%.
ADDITIONAL COMMENTS: Chalcopyrite enriched along selvage, several anhydrite vein generations.

Pieces 5A–5C

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
CONTACTS: None observed.
COLOR: White to gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine- to medium-grained, brecciated, clasts and disseminated in anhydrite matrix.
Anhydrite, 25%, medium- to coarse-grained, banded vein.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%, very fine-grained, in silica-pyrite clasts.
Chalcopyrite, 5%.
TEXTURAL DESCRIPTION: Semi-massive, breccia, medium-sized. Porosity 5%.
VEINS: Fractures.
ADDITIONAL COMMENTS: Chalcopyrite enriched along selvage, matrix-supported. Anhydrite is localized along fractures and has not extensively penetrated the surrounding rock.

Pieces 8B and 8C

ROCK TYPE: MASSIVE PYRITE BRECCIA WITH ANHYDRITE VEINS (Type 6)
CONTACTS: None observed.
COLOR: Brassy gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine-grained, in clasts, fractured.
Anhydrite, 12%, fine- to medium-grained, banded.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%, very fine- to fine-grained, silica is matrix in pyrite-silica clasts.
Chalcopyrite, 7%, very fine-grained.
TEXTURAL DESCRIPTION: Breccia, coarse.
VEINS: Mm-scale fractures filled with anhydrite.
ADDITIONAL COMMENTS: Fractures in clasts are filled with silica, second generation are anhydrite veins. Chalcopyrite is enriched along selvage.

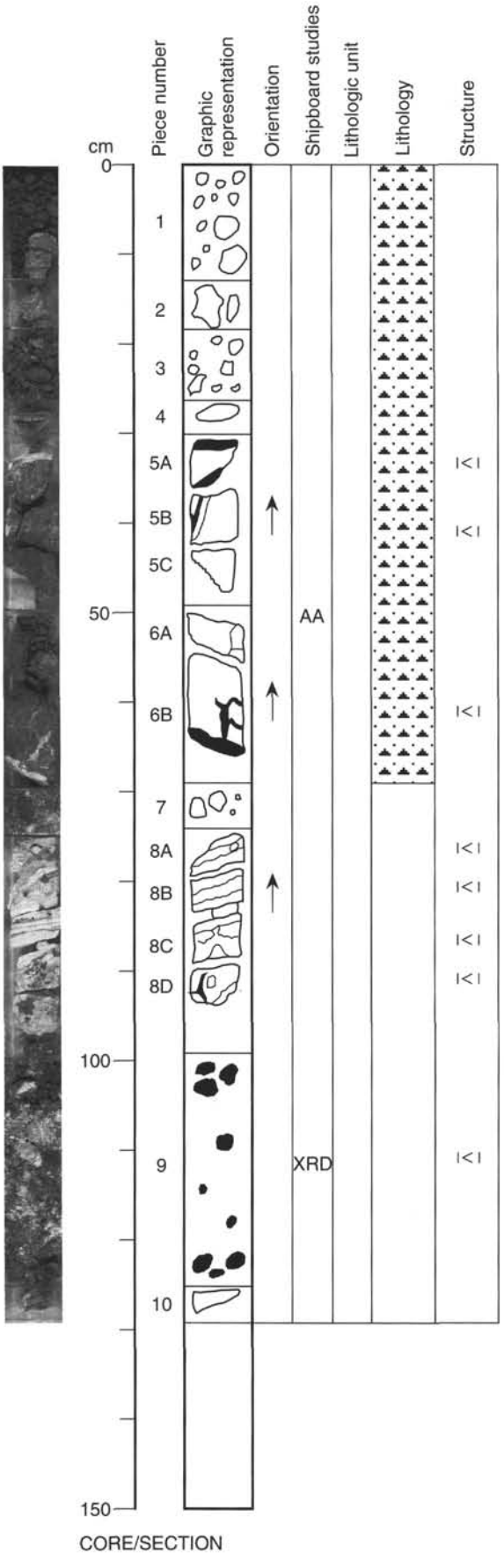
Pieces 9 and 11

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
CONTACTS: None.
COLOR: White to brassy gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 50%, fine- to medium-grained.
Pyrite, 48%, fine- to medium-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, fine-grained.
TEXTURAL DESCRIPTION: Drill cuttings.

158-957C-11N-3

Pieces 10A and 10B

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None observed.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 50%, fine-grained, mainly in clasts, some colloform.
Pyrite, 35%, fine- to coarse-grained, (1) disseminated in silica clasts, (2) overgrowing silica-sulfide clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 10%, fine- to medium-grained.
Anhydrite, 5%, fine- to medium-grained, as veins and matrix.
TEXTURAL DESCRIPTION: Clastic. Porosity ~2%.
VEINS: Fractures.
ADDITIONAL COMMENTS: Chalcopyrite along selvage. Anhydrite is localized along fractures but has penetrated into much of the surrounding rock along a system of very thin (≤1 mm) fractures. Pyrite-silica breccia with altered basalt clasts.



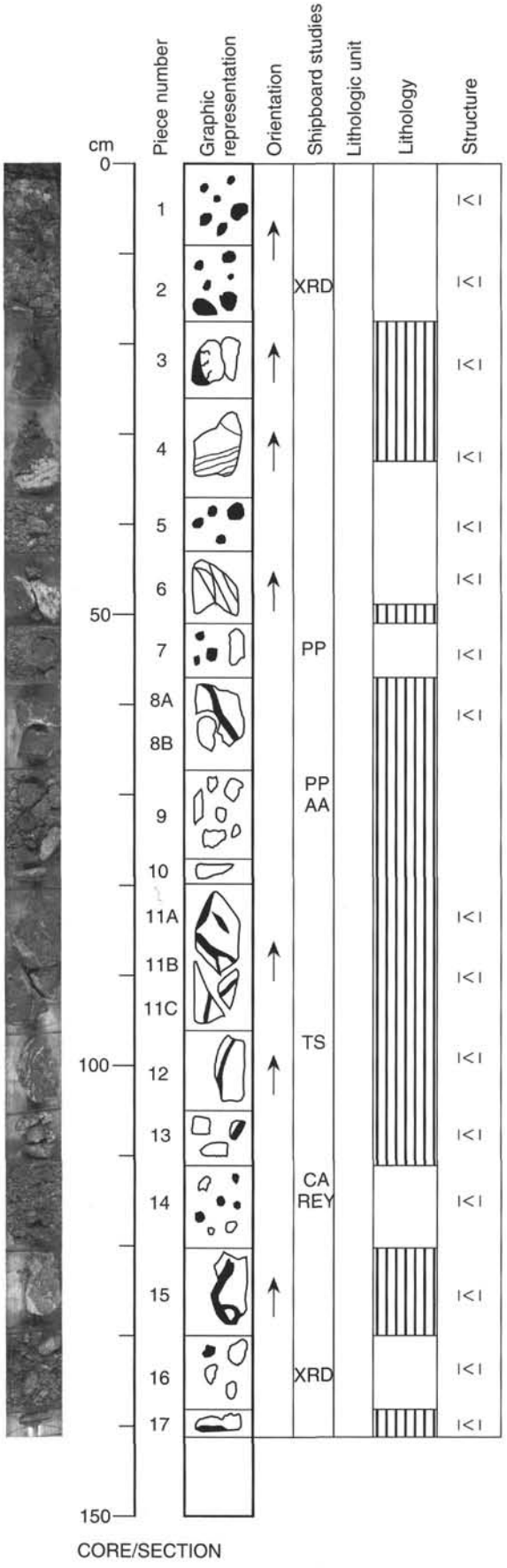
158-957C-12N-1

Pieces 1–6B

ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Green yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%,very fine- to fine-grained, disseminated and in fine- to medium-grained pyrite and pyrite plus silica clasts.
Anhydrite, 15%, fine-grained, breccia cement and veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 5%, disseminated, cement.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, small grains in pyrite.
TEXTURAL DESCRIPTION: Clast-supported breccia, nodular, clastic. Porosity 15%.
VEINS: 1-mm to 1-cm anhydrite veins.
ADDITIONAL COMMENTS: Anhydrite is localized along fractures, with apparently minor infiltration related to fluid movement along pore spaces. Massive pyrite-anhydrite breccia with altered basalt clasts.

Pieces 7–10

ROCK TYPE: ANHYDRITE VEIN (Type 11)
COLOR: White.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 95%, fine- to medium-grained, banded and crustiform.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%, fine-grained, in pyrite and anhydrite.
Pyrite, 2%, very fine-grained, disseminated in bands and one nodule (Piece10).
TEXTURAL DESCRIPTION: Banded and crustiform. Porosity 5%.
ADDITIONAL COMMENTS: Some dissolution in anhydrite up to 5 mm. Chalcopyrite as nodules in anhydrite and veins replacing(?) anhydrite and cutting anhydrite banding in large veins.



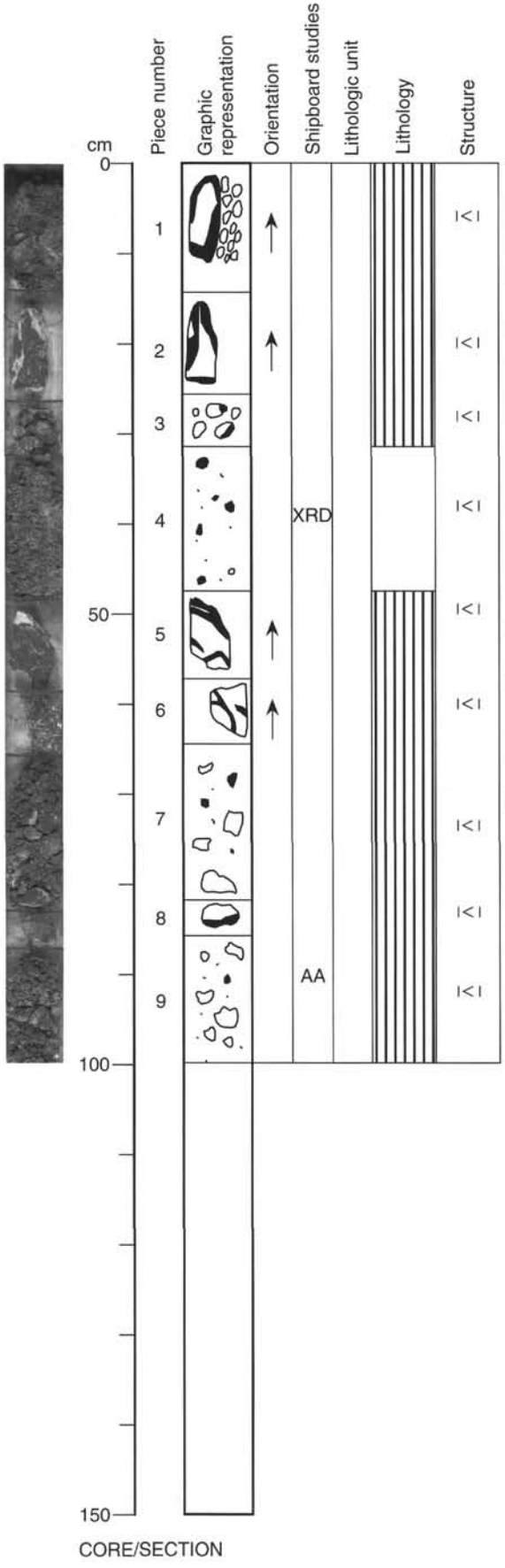
158-957C-12N-2

Pieces 1, 2, 4 (30–34 cm), 5, 6 (44–48 cm), 7, 14, and 16

ROCK TYPE: ANHYDRITE VEIN (Type 11)
COLOR: Light gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 90%, very fine- to fine-grained, euhedral, locally banded.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%.
Chalcopyrite, 5%.
TEXTURAL DESCRIPTION: Banded and crustiform.
ADDITIONAL COMMENTS: Pieces 1, 2, 5, 7, 14, and 16 are disaggregated anhydrite in a series of anhydrite veins.

Pieces 3, 4 (28–30 cm), 6 (48–50 cm), 8–13, 15, 17

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
COLOR: Green yellow to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 58%, fine- to very fine-grained, disseminated and fine to medium clasts in silica.
Silica, 25%, very fine-grained, cementing pyrite and clasts.
Anhydrite, 10%, fine-grained, 1- to 5-mm veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7%, locally concentrated along anhydrite veins.
TEXTURAL DESCRIPTION: Clastic, nodular. Porosity 5%.
VEINS:
Size: 1 to 5 mm.
Minerals: White anhydrite.
ADDITIONAL COMMENTS: Piece 8B is a large clast that was cut perpendicular to the orientation of the core. The piece is moderately fractured and anhydrite has penetrated into surrounding rock along the fracture system.



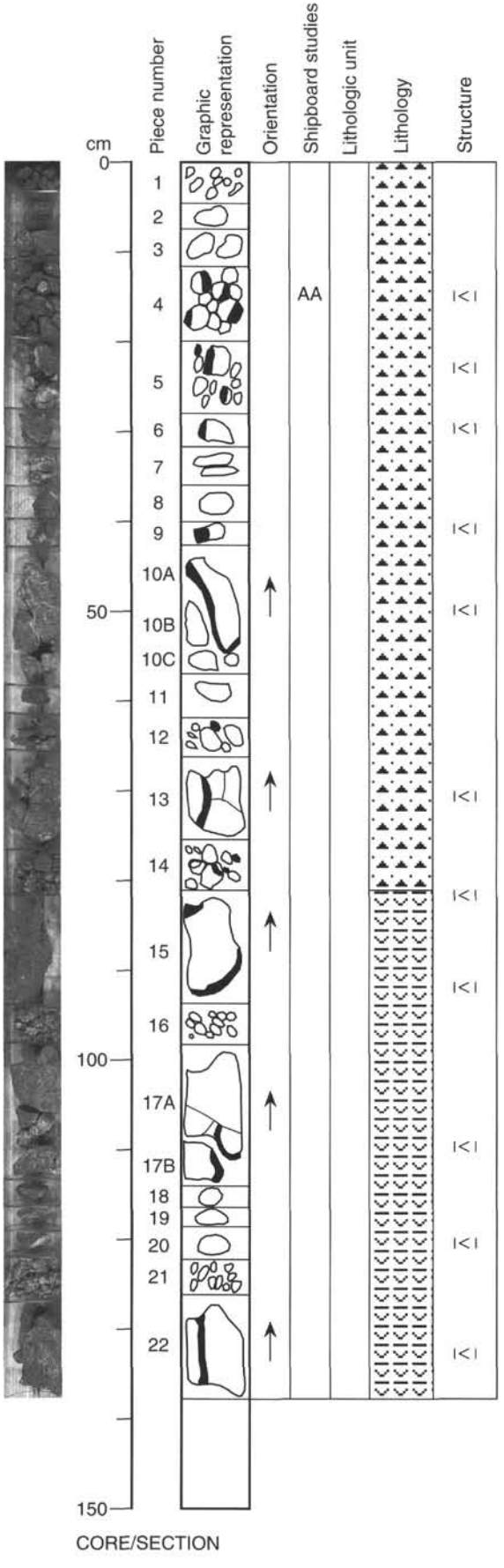
158-957C-12N-3

Pieces 1–3 and 5–9

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
COLOR: Gray, green yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 55%, very fine- to fine-grained, disseminated and in fine clasts.
Silica, 20%, very fine-grained, as cement around pyrite.
Anhydrite, 20%, fine-grained, veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, locally enriched in anhydrite veins.
TEXTURAL DESCRIPTION: Clastic to nodular. Porosity 5%.
VEINS:
Size: 1-mm to 1-cm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Pieces 7 and 8 are disaggregated. Piece 8 contains a 4-cm silica-sulfide clast, vermicular aggregate of pyrite, rimmed by clear quartz, in a gray cherty clast.

Piece 4

ROCK TYPE: ANHYDRITE VEIN (Type 11)
COLOR: Light gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 99%, cm-sized pieces and as sand.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine- to fine-grained.
Pyrite, very fine- to fine-grained.
ADDITIONAL COMMENTS: Fragmented, disrupted. Ground to sand during coring.



158-957C-13N-1

Pieces 1–14

ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine-grained, clasts and disseminated grains.
Anhydrite, 10%, fine-grained, veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 5%, cementing pyrite in clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, in pyrite.
TEXTURAL DESCRIPTION: Subrounded clasts of massive pyrite, fine to medium size. Porosity 10%.
VEINS:
Size: 3-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: An extensive network of mm-scale fractures is filled by anhydrite.

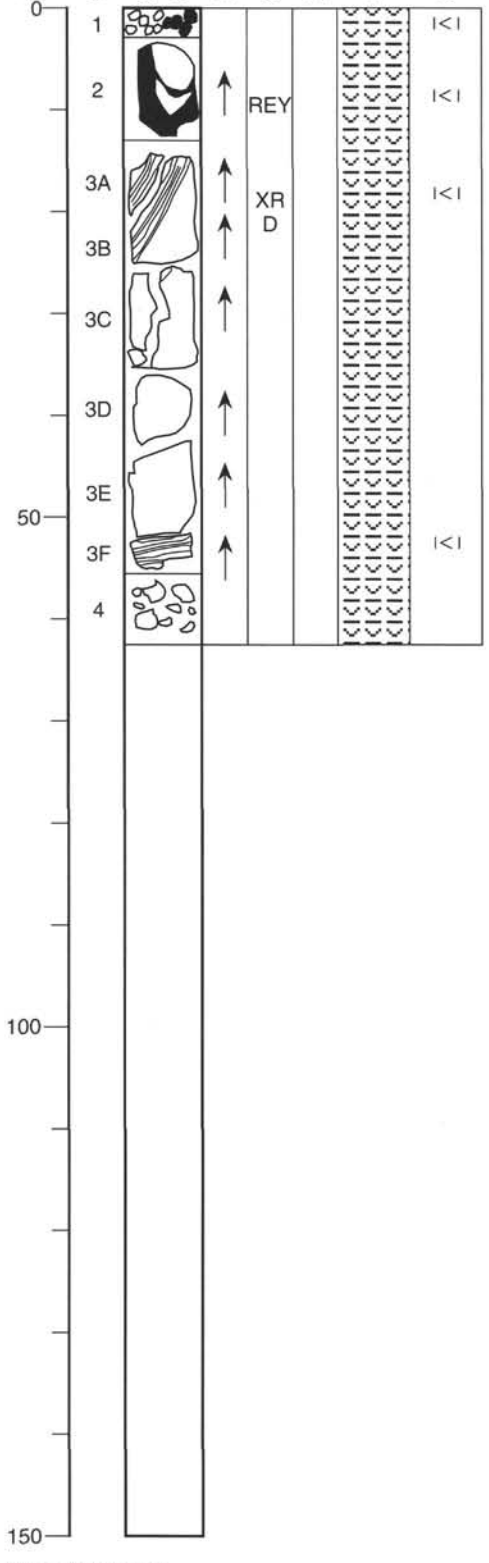
Pieces 15–22

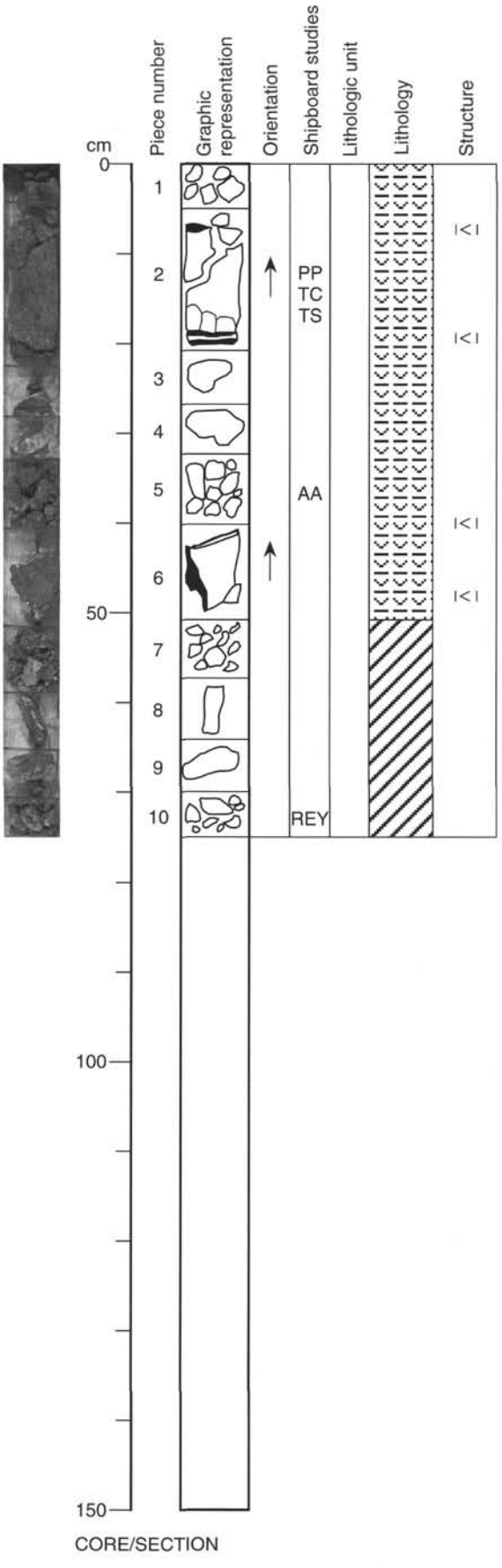
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 55%, fine- to very fine-grained, disseminated in silica and subrounded clasts.
Silica, 40%, cement and in clasts with pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 4%, veins and cement, and trace in porous silica-sulfide.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, in pyrite near anhydrite veins.
TEXTURAL DESCRIPTION: Clasts, fine to coarse size. Porosity 5%.
VEINS:
Size: 1- to 2-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Sulfide appears to be concentrated around silicic clasts. A silica-pyrite clast in Piece 17A contains fractures that are not found in the surrounding matrix.

158-957C-13N-2

Pieces 1–4

ROCK TYPE: PYRITE-SILICA BRECCIA, WITH ANHYDRITE VEINS (Type 9a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 63%, very fine-grained, massive clasts or disseminated in silica.
Silica, 30%, very fine-grained, cement in coarse clasts with pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine-grained, banded (veins not counted in % abundance).
Chalcopyrite, 2%, fine-grained, along anhydrite veins and disseminated in silica and pyrite clasts.
TEXTURAL DESCRIPTION: Clasts, fine to medium size. Porosity 5%.
VEINS:
Size: 3-cm veins.
Minerals: Anhydrite (banded) in Pieces 2, 3A, 3B, and 3F.
ADDITIONAL COMMENTS: Anhydrite veins make up 15% of the whole section. There is an anhydrite, pyrite, and chalcopyrite alteration halo associated with anhydrite veining.





158-957C-14N-1

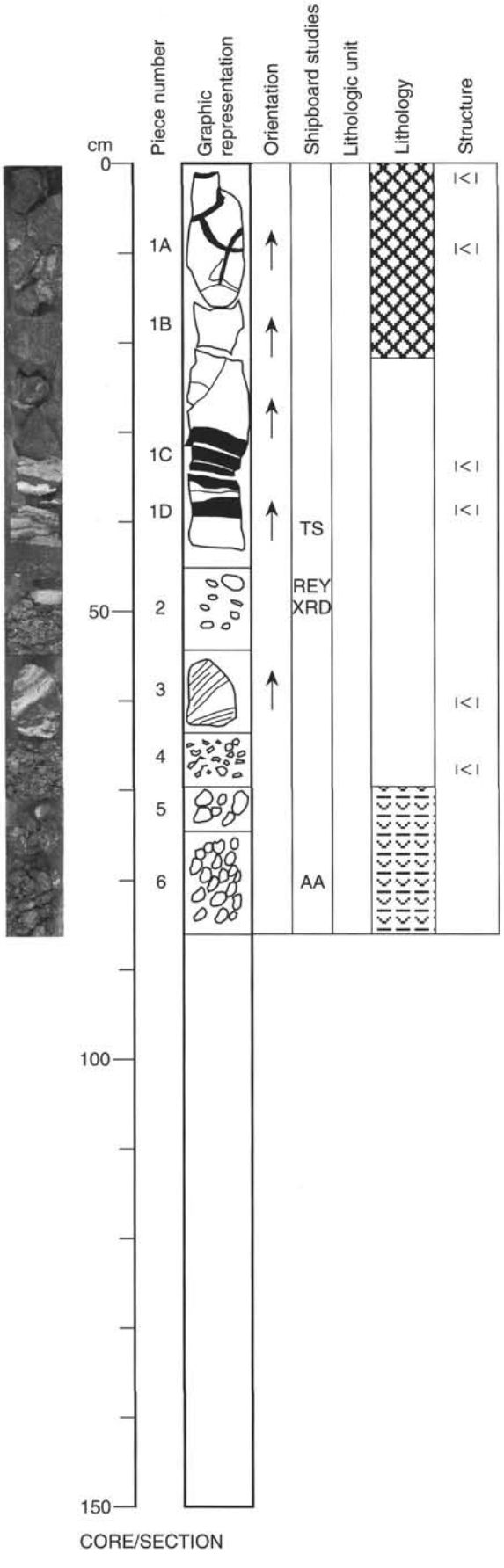
Pieces 1–6 and 9

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 53%, very fine- to fine-grained, disseminated, massive clasts.
Silica, 30%, very fine-grained, massive, cement.
Chalcopyrite, 10%, fine-grained, in anhydrite veins and disseminated near vein in Piece 6, also disseminated in pyrite clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 7%, fine-grained, veins and cement.
TEXTURAL DESCRIPTION: Clastic to nodular breccia, clasts fine to coarse. Porosity 7%.
VEINS:
Minerals: Anhydrite veins.
ADDITIONAL COMMENTS: Coarse clasts of massive pyrite are fragments of larger clasts (diameter greater than core, >5.5 cm). Anhydrite is localized along mm-scale fractures.

Pieces 7, 8, and 10

ROCK TYPE: MASSIVE SULFIDES(Type 5)
CONTACTS: None.
COLOR: White and yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chalcopyrite, 45%, fine-grained, in anhydrite veins and along selvage of anhydrite veins.
Pyrite, 30%, very fine- to fine-grained, disseminated and in massive pyrite-silica clasts.
Anhydrite, 15%, fine- to medium-grained, in veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%, fine-grained, as matrix in pyrite-silica breccia.
TEXTURAL DESCRIPTION: Alternating chalcopyrite- and anhydrite-rich layers. Pieces of pyrite-silica breccia with pyrite clasts in a silica matrix. Porosity 5%.
VEINS:
Minerals: Anhydrite, chalcopyrite in veins.
ADDITIONAL COMMENTS: Chalcopyrite is accompanied by a soft, green substance.

158-957C-14N-2

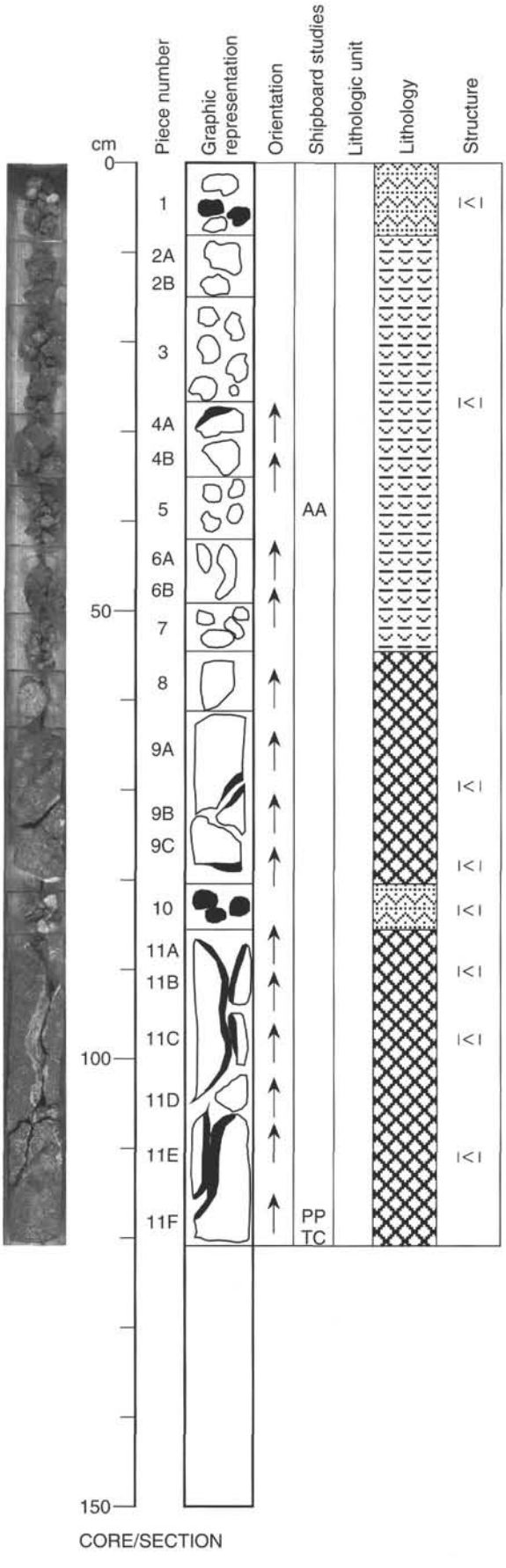


Pieces 1A and 1B

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 48%, fine-grained, clasts in silica.
Silica, 40%, fine-grained, matrix.
Anhydrite, 10%, as millimeter-wide veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, fine-grained.
TEXTURAL DESCRIPTION: Semi-massive breccia, veined. Porosity 7%.
VEINS:
Size: 1- to 3-mm-wide veins.
Orientation: Irregular.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Contains large clasts, probably altered basalt.

Pieces 1C, 1D, and 2–6

ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: None.
COLOR: White and yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
VEINS
Anhydrite, 80%, fine-grained, banded.
Chalcopyrite, 18%, fine-grained, 1- to 5-mm bands parallel to anhydrite banding, and a few crosscutting.
MASSIVE SULFIDE
Pyrite, 75%, very fine-grained.
Chalcopyrite, 20%, fine-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
VEINS Pyrite, 2%, very fine-grained.
MASSIVE SULFIDE Anhydrite, 5%, fine-grained, small veins.
TEXTURAL DESCRIPTION: Massive sulfide contains some silicic clasts. Massive sulfide porosity 5%. Vein porosity 2%.
VEINS:
Size: 1- to 10-mm-wide veins.
Orientation: Banded.
Minerals: Anhydrite and chalcopyrite.
ADDITIONAL COMMENTS: Alternating anhydrite veins and massive sulfides. Pieces 5 and 6 logged as pyrite-silica breccias (Type 9a).



158-957C-15N-1

Pieces 1 and 10

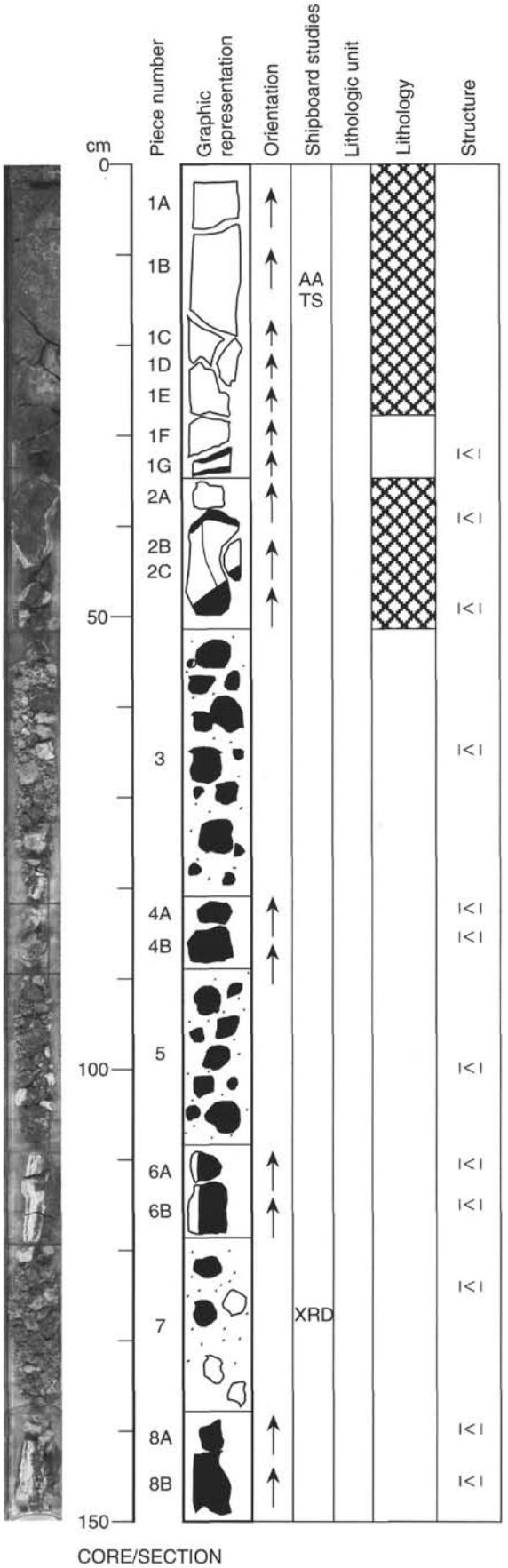
ROCK TYPE: DRILL CUTTINGS
COLOR: White to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 50%, fine- to medium-grained, crosscutting vein, sugary.
Pyrite, 40%, fine- to medium-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 5%, very fine-grained.
Chalcopyrite, 5%, fine-grained, along selvage of anhydrite vein and in the center of vein.
TEXTURAL DESCRIPTION: Drill cuttings.
ADDITIONAL COMMENTS: *Small pieces of anhydrite vein material with pieces of surrounding pyrite-silica breccia.*

Pieces 2A–7

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
COLOR: Brassy yellow to gray white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine- to medium-grained, clastic and nodular.
Anhydrite, 13%, fine- to medium-grained, veins.
Silica, 10%, very fine-grained, as discrete clasts and in matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7% fine-grained, rimming pyrite.
TEXTURAL DESCRIPTION: Porosity 5%.

Pieces 8, 9A–9C, and 11A–11F

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: Crosscut by multiple anhydrite veins, with altered basalt breccia.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 45%, very fine-grained, siliceous clasts, heavily fractured and in matrix.
Pyrite, 40%, fine- to medium-grained, pyrite clasts and disseminated in matrix.
Anhydrite, 15%, fine- to medium-grained, in crosscutting veins, banded.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, within the anhydrite vein center, not along the selvage.
TEXTURAL DESCRIPTION: Semi-massive, clastic. Porosity 5%–10%.
VEINS:
Size: Anhydrite vein steeply dipping, 1-cm wide.
Orientation: 85° to 110°.
Minerals: Anhydrite and chalcopyrite.
ADDITIONAL COMMENTS: Silica-rich clasts with disseminated pyrite are heavily fractured and filled with pyrite. Unusual clasts of beige silica filled with pyrite. Many barren fractures, especially in Piece 9, possibly indicating loss of anhydrite. Pieces 11A–11F cut by anhydrite vein.



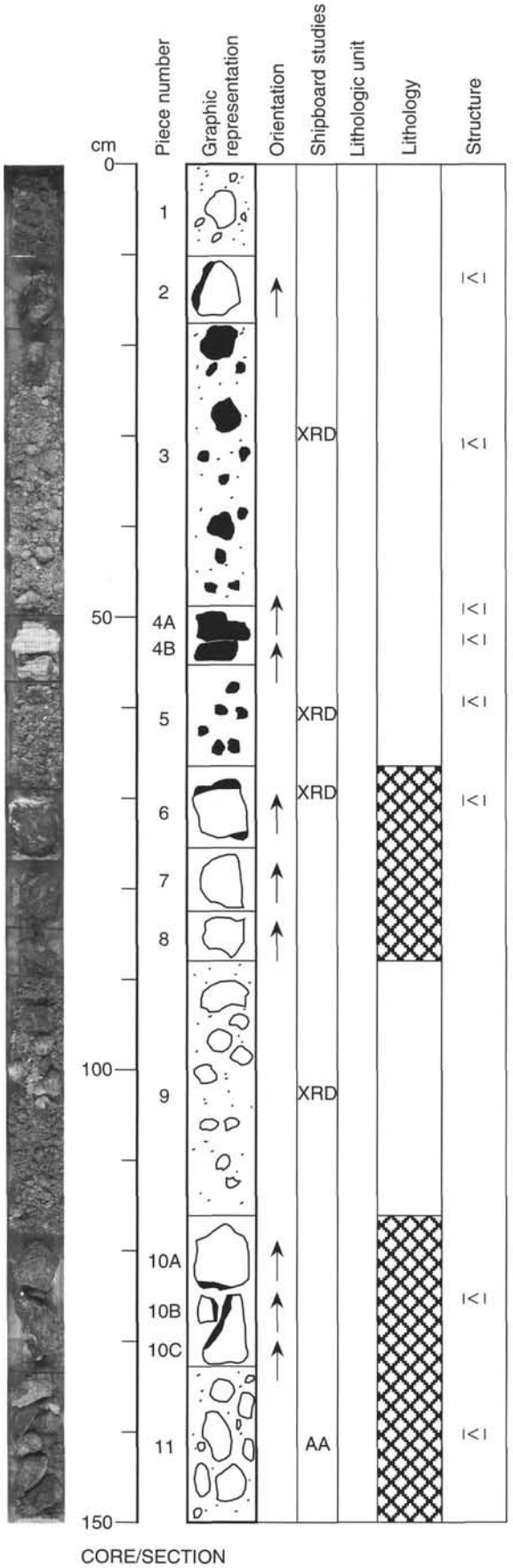
158-957C-15N-2

Pieces 1A–1E and 2B–2C

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 45%, very fine-grained.
Pyrite, 45%, fine- to coarse-grained.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 7%, fine- to medium-grained, veins.
Chalcopyrite, 3%, fine- to medium-grained, euhedral.
TEXTURAL DESCRIPTION: Pyrite nodules (up to 1 cm in diameter) and disseminated pyrite in silica matrix. Chalcopyrite occurs at the selvage of and within small anhydrite veins.
ADDITIONAL COMMENTS: Fragments of altered rock are silicified and exhibit fine-grained disseminated pyrite; fractures within these fragments are filled with pyrite. Pyrite nodules in the breccia are often rimmed by cavities. Within the siliceous wallrock fragments of Piece 1B, an early generation of mm-scale fractures are filled by silica. Abundant barren fractures may indicate loss of material, possibly by dissolution. Piece 2 cut by an anhydrite vein.

Pieces 1F–1G, 2A, and 3–8B

ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: Chalcopyrite selvage to surrounding silica-pyrite breccia.
COLOR: Yellow to white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chalcopyrite, 10%–35%, fine- to medium-grained, euhedral in cavities, also along selvages of and within anhydrite veins.
Silica, 10%–30%, very fine-grained, matrix in silica-pyrite breccia.
Pyrite, 25%, fine- to medium-grained, clasts and disseminated in silica matrix and anhydrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 10%–55%, fine- to medium-grained, vein.
TEXTURAL DESCRIPTION: Thick chalcopyrite selvage around small anhydrite veinlet crosscutting semi-massive silica-pyrite breccia. Chalcopyrite selvage is irregular and thickness varies from <0.5 cm to 1.0 cm. Pyrite in breccia is nodular. Breccia is matrix supported.
VEINS:
Size: 0.3-cm anhydrite with 0.7-cm chalcopyrite.
ADDITIONAL COMMENTS: Pieces 1F–1G, and 2A contain 35% chalcopyrite, 30% silica, and 25% pyrite. Other pieces of this rock type are generally more anhydrite-rich (55%), with lesser chalcopyrite (10%). Much of this material above is very fragmented.



158-957C-15N-3

Pieces 1–5

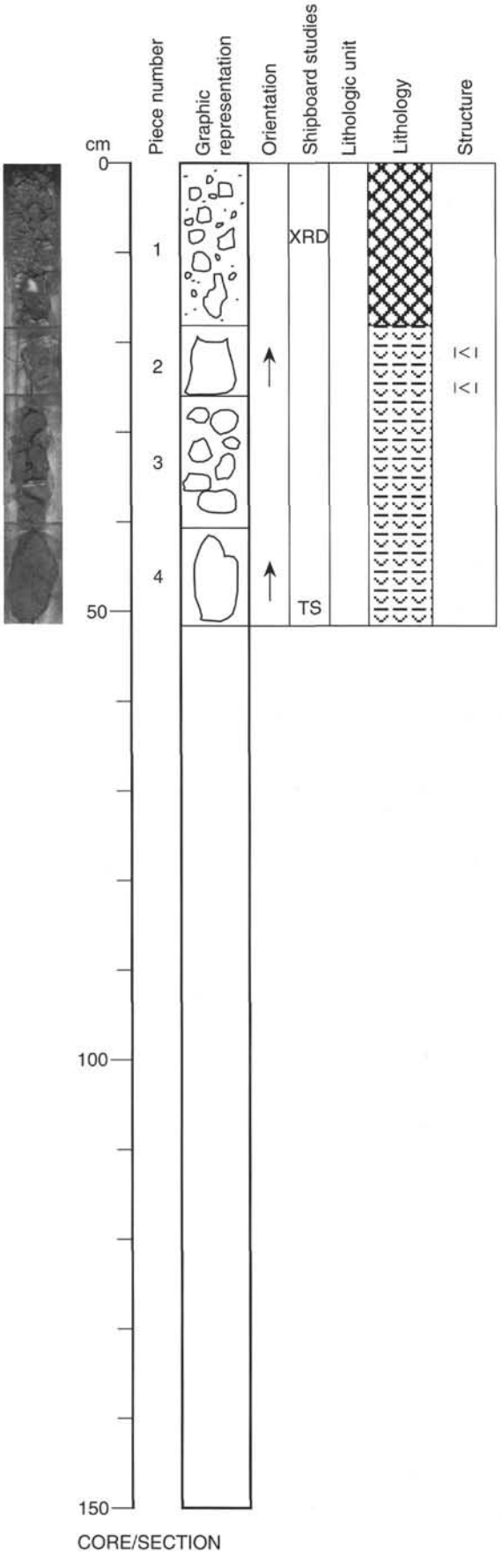
ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: None.
COLOR: White.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 95%, fine- to coarse-grained, banded crustiform veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 3%, very fine- to fine-grained, enriched in sulfide layers and disseminated in surrounding breccia.
Silica, 2%, very fine-grained, from surrounding breccia.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine- to medium-grained, in sulfide-rich layers and aggregates up to 0.5 cm in anhydrite.
TEXTURAL DESCRIPTION: Alternating sulfide-rich and sulfide-poor bands.
ADDITIONAL COMMENTS: Pieces 1, 3, and 5 are fine drill cuttings. Silica comes from the surrounding silica-pyrite breccia.

Pieces 6–8 and 10A–11

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 50%, very fine-grained, matrix.
Pyrite, 40%, fine- to medium-grained, disseminated in silica matrix, in nodules, and in veinlets.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 10%, fine- to medium-grained, in veins and cavities.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, disseminated, enriched along and in anhydrite veins.
TEXTURAL DESCRIPTION: Disseminated and nodular pyrite in silica matrix, pyritic clasts, small fractures and vugs filled with anhydrite.
ADDITIONAL COMMENTS: Pyrite nodules are often lined by cavities. Some fragments have a much higher silica content and very fine-grained disseminated pyrite (altered basalt clasts?).

Piece 9

ROCK TYPE: ANHYDRITE VEIN (Type 11)
COLOR: White gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 65%, medium- to coarse-grained, anhydrite sand (drill cuttings).
Pyrite, 20%, fine- to medium-grained, disseminated in siliceous clasts and in anhydrite.
Silica, 15%, very fine-grained, matrix.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine- to medium-grained, disseminated in anhydrite.
TEXTURAL DESCRIPTION: Medium- to coarse-grained anhydrite sand with fragments of silica-pyrite breccia.
ADDITIONAL COMMENTS: Drill cuttings. Chalcopyrite is accompanied by very small, soft green material (clay?). Some fragments have a much higher silica content and very fine-grained disseminated pyrite (altered basalt clasts?).



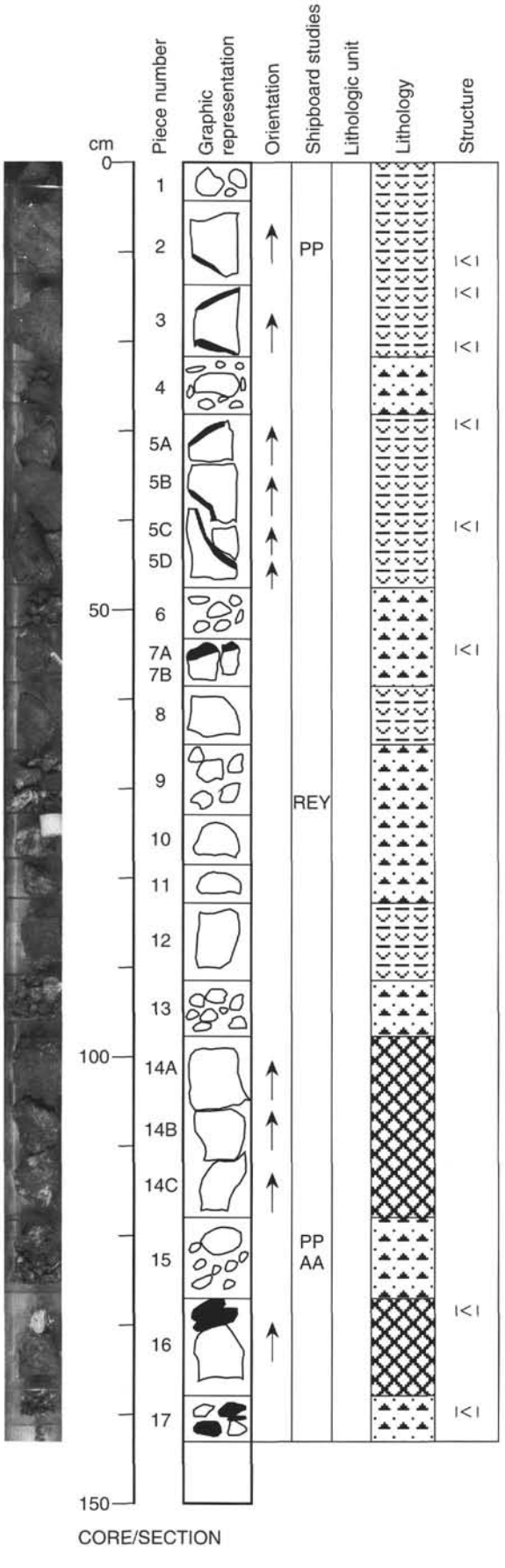
158-957C-15N-4

Piece 1

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 45%, very fine-grained, matrix.
Anhydrite, 30%, medium- to coarse-grained, anhydrite sand and veinlets.
Pyrite, 20%, fine- to medium-grained, disseminated and nodular in silica matrix, disseminated euhedral in anhydrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, disseminated.
TEXTURAL DESCRIPTION: Disseminated and nodular pyrite in silica matrix, small veins of anhydrite, some vugs filled with anhydrite. Approximately 35% of the sample is anhydrite sand with disseminated euhedral pyrite.
ADDITIONAL COMMENTS: Chalcopyrite probably related to anhydrite veins. Pyrite nodules are commonly lined by cavities. Chalcopyrite-anhydrite mixtures show rare soft patches of green material. (Type 3). Drill cuttings.

Pieces 2–4

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 55%, very fine-grained, matrix.
Pyrite, 40%, fine- to medium-grained, disseminated and nodular (up to 0.5 cm) in breccia, euhedral disseminated in anhydrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, medium- to coarse-grained, veinlets and sand.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine- to medium-grained, disseminated in anhydrite veinlets.
TEXTURAL DESCRIPTION: Disseminated pyrite and pyrite nodules in a highly siliceous matrix. Breccia fragments are lined with anhydrite veinlets (plus chalcopyrite). Porosity 5%.
ADDITIONAL COMMENTS: Pyrite nodules are often lined by cavities. Dark patches (few mm in diameter) are visible in siliceous matrix. Piece 4 seems to be a little darker than the rest of this sample type.



158-957C-16N-1

Pieces 1–3, 5A–5D, 8, and 12

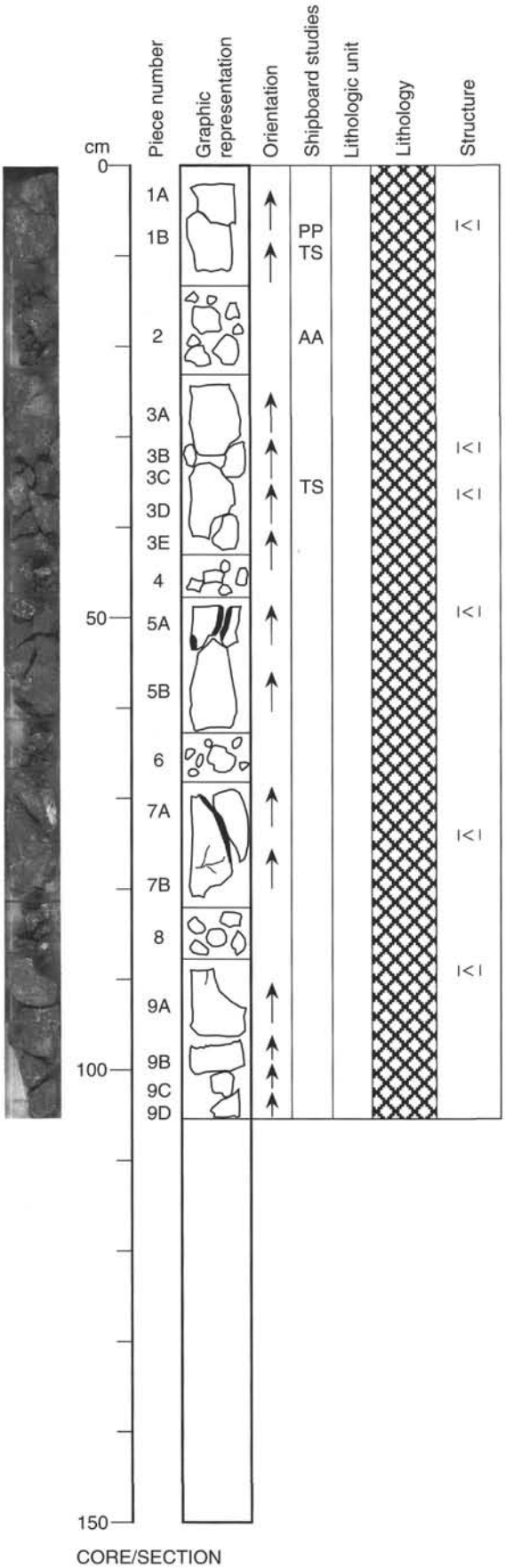
ROCK TYPE: NODULAR PYRITE SILICA BRECCIA (Type 9b)
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 66%, very fine-grained, in clasts.
Pyrite, 30%, very fine-grained, disseminated and as fine clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, fine-grained, only present in veins.
Chalcopyrite, 1%, fine-grained, only present in veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red chert, as 1-mm clasts, in Pieces 3 and 8.
TEXTURAL DESCRIPTION: Breccia, nodular, matrix supported. Porosity 5%.
VEINS:
Size: 5-mm veins.
Minerals: Pyrite, anhydrite, chalcopyrite
ADDITIONAL COMMENTS: Silica and pyrite assemblage is possibly silicified basalt, that is, stockwork.

Pieces 4, 6–7, 9–11, 13, 15, and 17

ROCK TYPE: PYRITE-ANHYDRITE BRECCIA-(VEIN RELATED) (Type 7d)
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine-grained, euhedral.
Anhydrite, 30%, very fine- to fine-grained, in veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7%, fine-grained.
Silica, 3%, very fine-grained, disseminated.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Green mineral in fracture of Piece 15.
TEXTURAL DESCRIPTION: Massive. Porosity 5%.
VEINS: Network of anhydrite veins.
ADDITIONAL COMMENTS: Mostly fragments from a major vein.

Pieces 14A–14C and 16

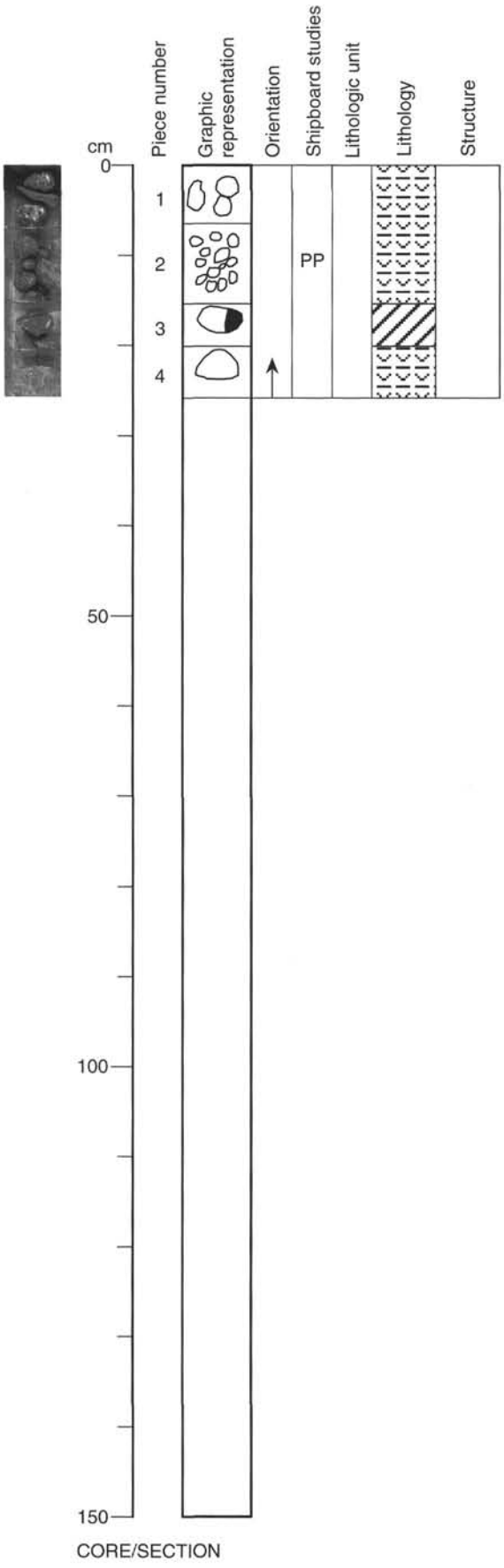
ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
COLOR: Yellow gray to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 52%, very fine-grained, in fine to coarse clasts.
Pyrite, 35%, very fine-grained, disseminated in clasts and veins.
Anhydrite, 10%, fine-grained, mainly in veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%, fine-grained, in veins and rimming clasts.
TEXTURAL DESCRIPTION: Clast-supported breccia.
VEINS:
Size: 4-cm veins.
Minerals: anhydrite and minor chalcopyrite.
ADDITIONAL COMMENTS: Pieces 14B and 14C contain mm-scale fractures filled with silica. These are cut by late anhydrite veins. Abundant barren veins may indicate the removal of material, possibly by dissolution.



158-957C-16N-2

Pieces 1–9

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
COLOR: Yellow gray or gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 52%, very fine- to fine-grained.
Silica, 43%, very fine-grained, in clasts with very fine-grained disseminated pyrite.
Quartz, 3%, fine-grained, white, euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 1%, very fine-grained, disseminated and interstitial.
Anhydrite, 1%, fine-grained, in veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red chert, 3-mm clasts in Pieces 1B and 3 (only in working half).
TEXTURAL DESCRIPTION: Clast-supported breccia. Porosity 10%.
VEINS:
Size: 1- to 3-mm quartz veins, 1- to 3-mm anhydrite vein.
Minerals: Quartz or anhydrite.
ADDITIONAL COMMENTS: Some coarse clast fragments are clearly silicified basalt, such as in Pieces 7 and 9. Piece 9D is a nodular pyrite-silica breccia. Anhydrite is localized along mm-scale fractures.



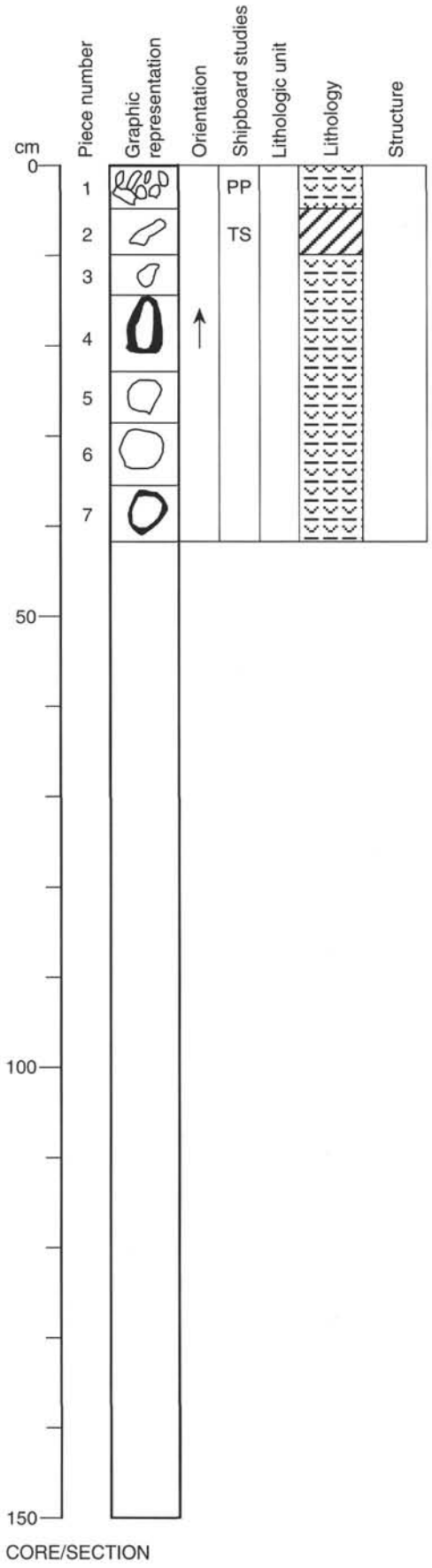
158-957E-1R-1

Pieces 1, 2, and 4

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray green and white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 50%, very fine- to fine-grained.
Pyrite, 42%, fine- to coarse-grained, disseminated and nodular aggregates.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, medium-grained, mainly vein related.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine- and medium-grained aggregates, vein related.
TEXTURAL DESCRIPTION: Disseminated pyrite and pyrite nodules in a matrix of gray quartz. Crosscutting irregular veins of white quartz. Porosity 5%.
VEINS:
Size: 2-mm veins.
Orientation: Irregular.
Minerals: Silica veinlets.
ADDITIONAL COMMENTS: Pyrite nodules are lined by cavities and in places crosscut by white silica veinlets.

Piece 3

ROCK TYPE: MASSIVE SULFIDE (Type 5)-VEIN SELVAGE
CONTACTS: None.
COLOR: Gray green and white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine- to medium-grained, subangular clasts.
Chalcopyrite, 20%, medium-grained, selvage and intergrowth with pyrite, rimming pyrite clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine- to coarse-grained, vein crosscutting pyrite.
Quartz, 5%, fine-grained, within pyrite clasts and matrix.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite(?), very fine-grained, always intergrown with chalcopyrite.
TEXTURAL DESCRIPTION: Chalcopyrite selvage of anhydrite vein (vein not present), massive pyrite with rare chalcopyrite adjacent. Massive pyrite is crosscut by anhydrite veinlets. Porosity <5%.
VEINS:
Size: 7-mm (chalcopyrite selvage), 1-mm anhydrite veinlets.
Minerals: Chalcopyrite, anhydrite.
ADDITIONAL COMMENTS: Chalcopyrite is intergrown with greenish soft material (chlorite?).



158-957E-2R-1

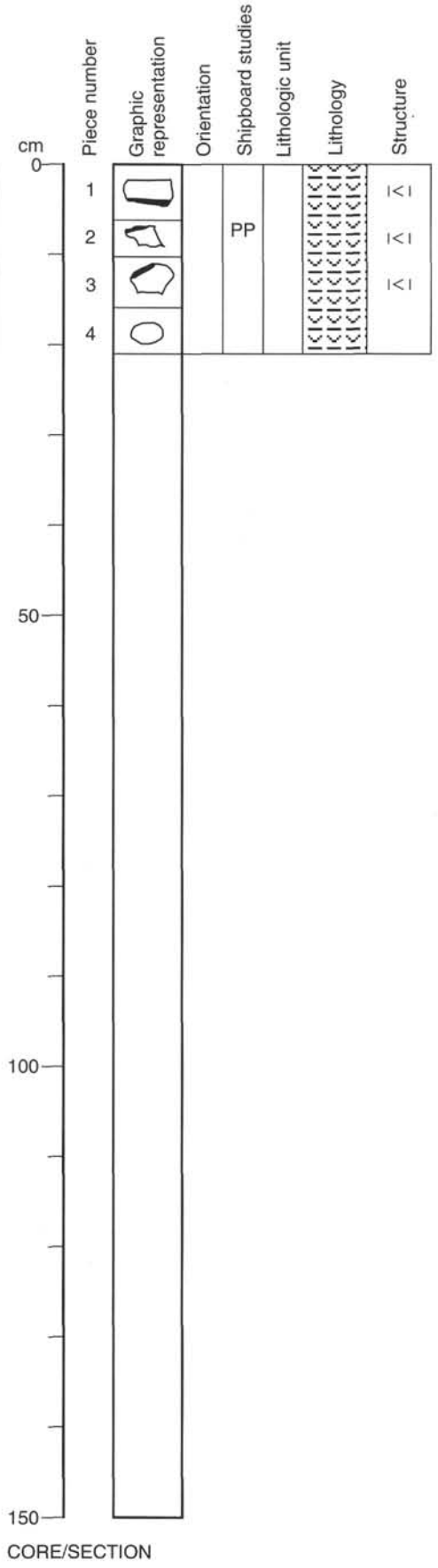
Pieces 1 and 3–7

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Yellow green, gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 55%, fine-grained, matrix and small veinlets.
Pyrite, 40%, fine- to coarse-grained, disseminated, nodular aggregates, euhedral in pore spaces.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine- to coarse-grained, vein related, filling cavities.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, associated with anhydrite.
Chlorite(?), very fine-grained, filling pore spaces in pyrite, greenish soft material.
TEXTURAL DESCRIPTION: Disseminated pyrite and pyrite nodules in gray quartz matrix, crosscutting veinlets of white silica and anhydrite. Porosity <5%.
VEINS:
Size: 1-mm veins.
Orientation: Irregular.
Minerals: Anhydrite and quartz veinlets.
ADDITIONAL COMMENTS: A 1-mm-wide white silica veinlet in Piece 4 shows pyrite selvage. Nodules up to 1.5 cm.

Piece 2

ROCK TYPE: MASSIVE SULFIDE (Type 5)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine- to medium-grained, banded, massive.
Chalcopyrite, 40%, fine- to medium-grained, banded, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, medium- to coarse-grained, vein.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite(?), very fine-grained, associated with chalcopyrite.
TEXTURAL DESCRIPTION: Massive sulfide with alternating layers of pyrite and chalcopyrite (<1 mm). Piece is surrounded by anhydrite, probably part of a chalcopyrite-pyrite-anhydrite vein.
VEINS:
Minerals: Chalcopyrite + anhydrite veins.
ADDITIONAL COMMENTS: Chalcopyrite is intergrown with greenish soft material (chlorite?).

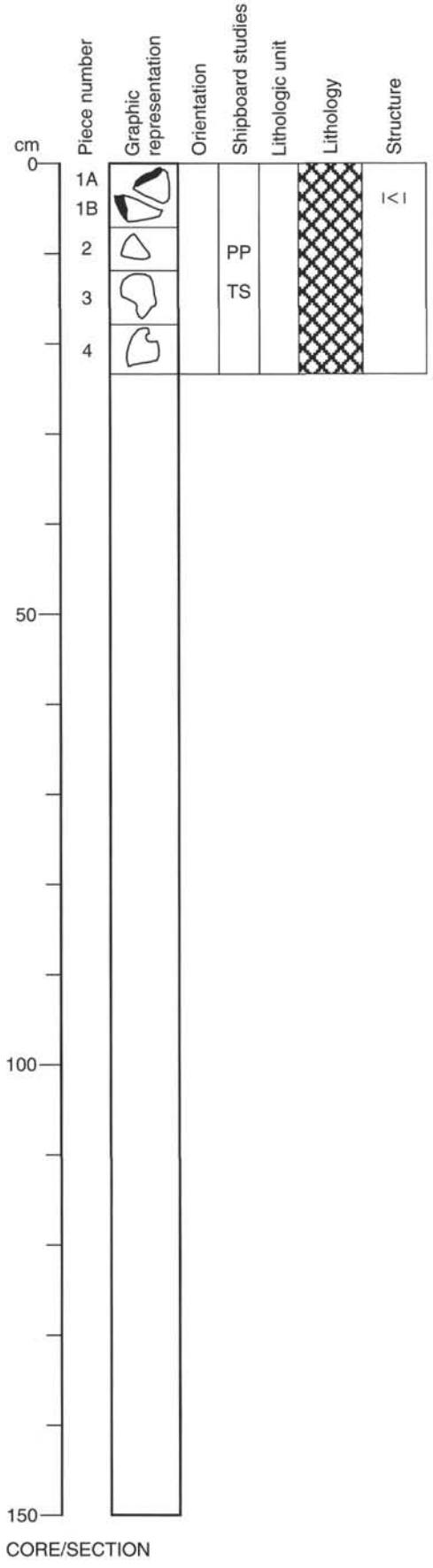
158-957E-3R-1



Pieces 1–4

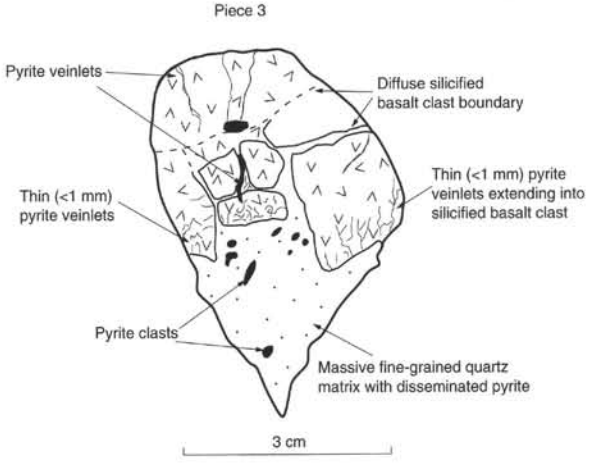
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 45%–50%, fine-grained, gray matrix.
Pyrite, 40%, disseminated, euhedral aggregates up to 0.5 cm.
Chalcopyrite, 5%–10%, fine-grained, dominantly at vein margin.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, margin of fragments and in a few open cavities.
TEXTURAL DESCRIPTION: Rounded fragments, drill cuttings, possibly similar to siliceous clasts in nodular siliceous pyrite-anhydrite breccia.
ADDITIONAL COMMENTS: Piece 1: Probably from margin of anhydrite vein with chalcopyrite-pyrite selvage—piece broken on edge of vein. Fragments of pyrite-silica resemble mineralized siliceous wallrock breccia (also found as clasts in anhydrite matrix in Interval 158-957G-3N-1, Pieces 4 to 6).

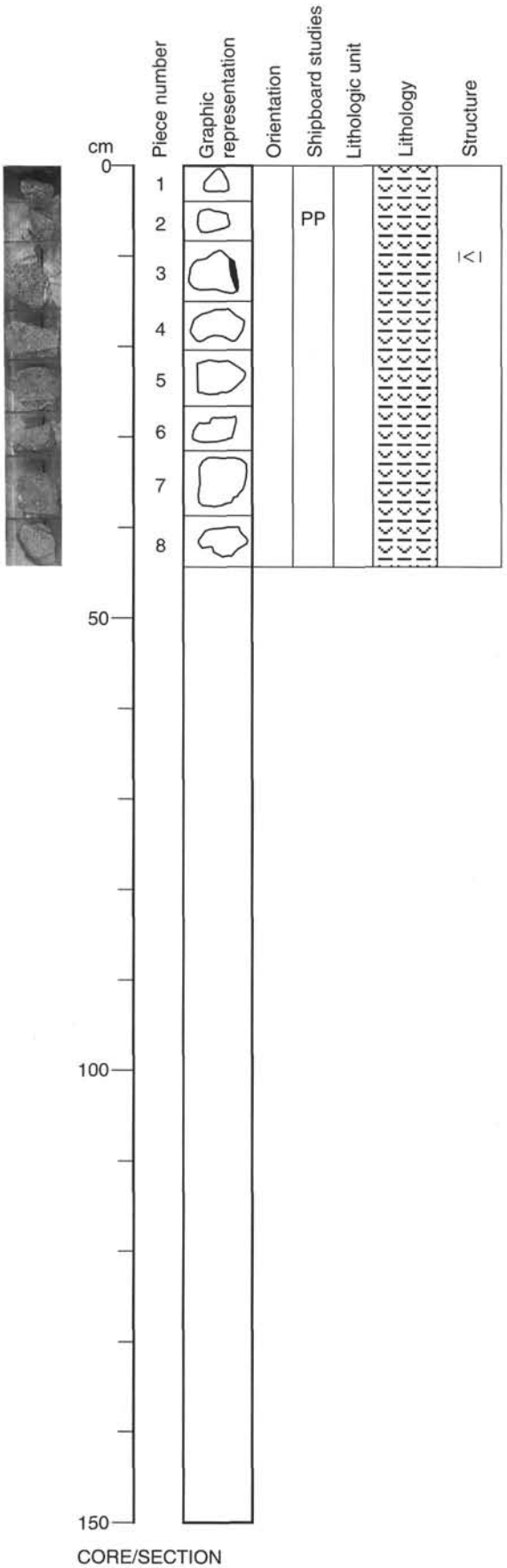
158-957E-4R-1



Pieces 1A–4

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 60%, fine- to medium-grained, in matrix of siliceous clasts and in 1- to 2-mm veinlets.
Pyrite, 30%, fine- to medium-grained, disseminated in altered fragments and in small veinlets (2–3 mm).
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, dominantly along anhydrite vein.
Anhydrite, 2%, fine- to medium-grained, dominantly as 0.5- to 1-cm vein in Piece 1.
Clays, 2%, very fine-grained, in basalt fragments.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, fine-grained patch, altered basalt fragment(?).
TEXTURAL DESCRIPTION: Fragments of siliceous, mineralized wallrock with basalt fragments in Pieces 1, 3, and 4.
VEINS:
Size: 0.5- to 1-cm veins.
Minerals: Anhydrite with chalcopyrite selvege in Piece 1.
ADDITIONAL COMMENTS: Dominantly altered basalt fragments up to 3 cm. Variably altered to quartz in Piece 1 and buff-colored clays ± chlorite in Pieces 2, 3, and 4.

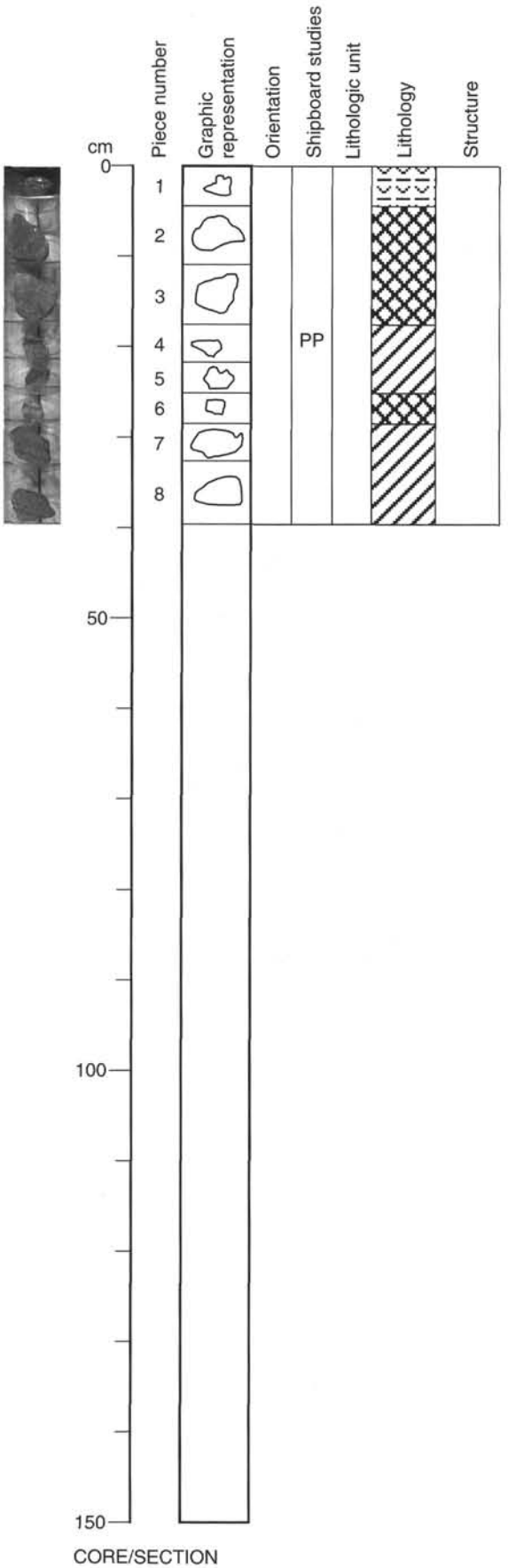




158-957E-5R-1

Pieces 1–8

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 65%, very fine-grained to fine-grained, euhedral crystals lining vugs and cement.
Pyrite, 32%, very fine-grained, nodules up to 1 cm in quartz, euhedral crystals in open spaces.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, medium-grained, in small veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, enriched in sulfide veins associated with anhydrite. Rims on pyrite nodules, and local enrichment in some nodules.
Fe-oxides, very fine-grained.
TEXTURAL DESCRIPTION: Possibly siliceous clasts in pyrite anhydrite breccia. Porosity 5%.
VEINS:
Size: 2- to >5-mm veins.
Minerals: Anhydrite, pyrite and chalcopyrite.
ADDITIONAL COMMENTS: Piece 5, 1-cm basalt clast replaced by silica and pyrite. Common 1- to 5-mm siliceous clasts of quartz plus pyrite. Pyrite is enriched at the outer part of siliceous clasts. Millimeter-sized open spaces with euhedral pyrite and quartz are typical around the largest pyrite clasts. Chalcopyrite nodules occur in Piece 3.



158-957E-6R-1

Piece 1

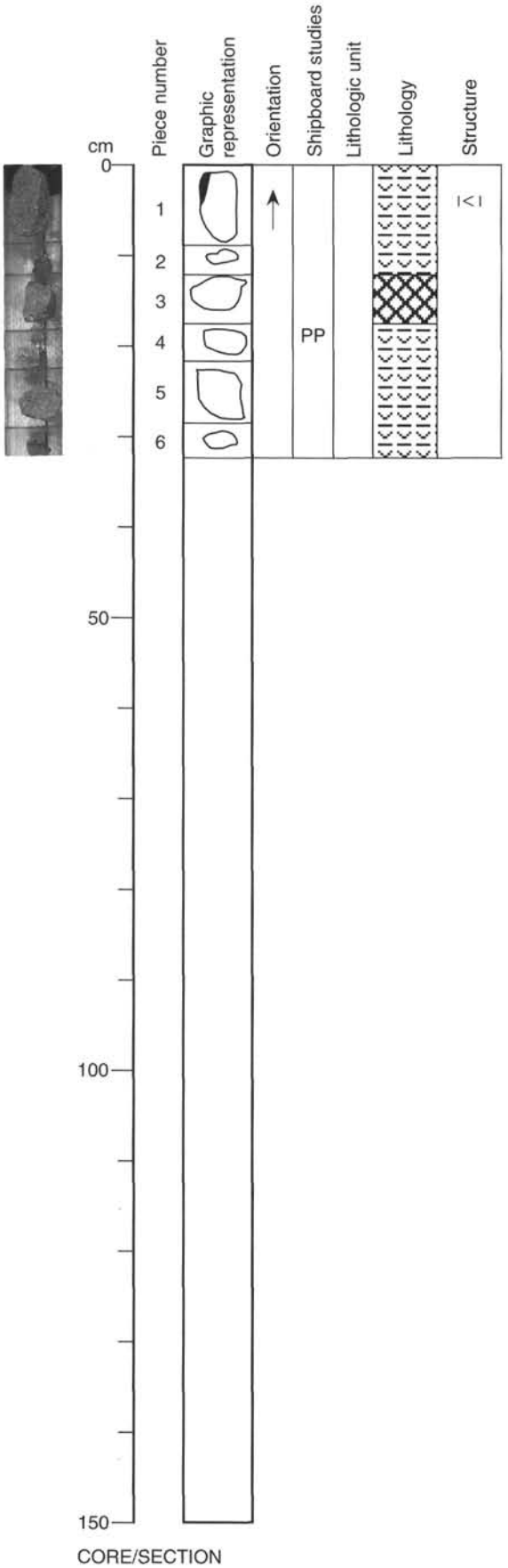
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 66%, very fine-grained, gray matrix.
Pyrite, 25%, fine-grained, 0.1- to 0.2-mm clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 4%, fine-grained, massive on broken surface.
Anhydrite, 5%, fine-grained, on broken surface, locally interstitial.
TEXTURAL DESCRIPTION: Breccia. Open spaces 3%

Pieces 2, 3 and 6

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 70%, very fine- to fine-grained, replacing basalt, in veins, and cementing basalt clasts.
Pyrite, 20%, very fine- to fine-grained, replacing basalt.
Clay minerals, 10%, very fine-grained, replacing basalt groundmass.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, interstitial to pyrite in pyrite-rich area of Piece 3.
TEXTURAL DESCRIPTION: Breccia. Porosity 5%.
VEINS:
Size: 1- to 5-mm veins.
Minerals: Quartz.
ADDITIONAL COMMENTS: Piece 6 was originally coarser grained basalt than Piece 3. Piece 3 has a 2-cm-wide pyrite-rich zone on one side, possibly a replacement vein.

Pieces 4–5, and 7–8

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow, gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 94%, very fine- to fine-grained, euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%, interstitial, disseminated.
Quartz, 3%, in silicified basalt and other siliceous clasts.
Anhydrite, 3%, fine-grained, euhedral, on broken surfaces and in pores.
TEXTURAL DESCRIPTION: Massive, recrystallized. Porosity 3%.
VEINS:
Size: 1-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: 1- to 2-cm silicified basalt clasts in Pieces 2, 7, and 8. Piece 4 is more siliceous than the others. Chalcopyrite is most abundant in Piece 2. Anhydrite on broken surfaces may be former veins.



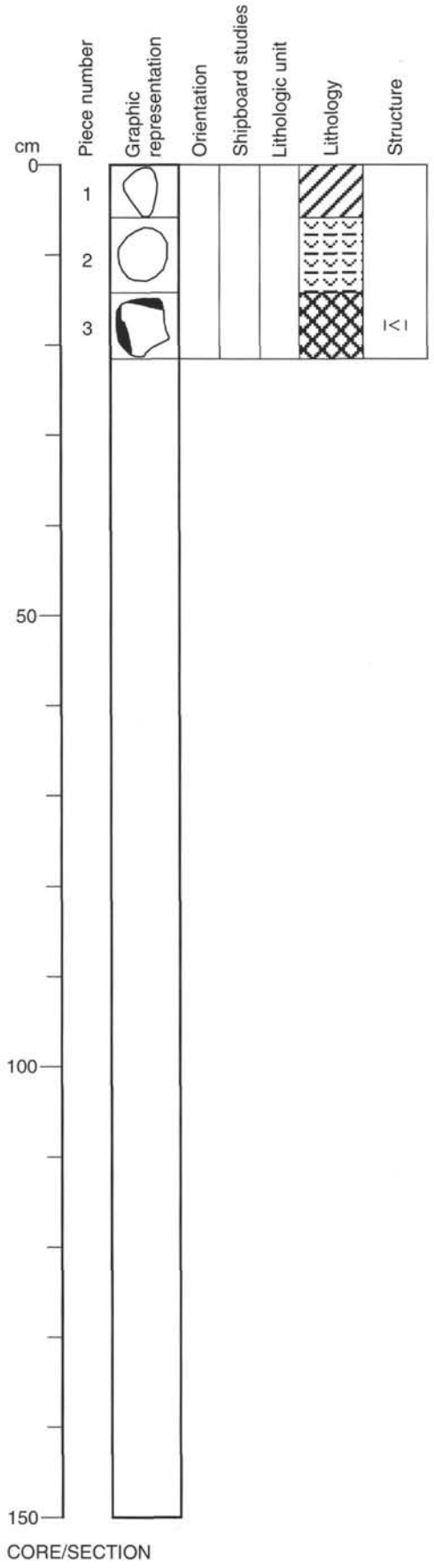
158-957E-7R-1

Pieces 1–2 and 4–6

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 68%, fine-grained, euhedral crystals in open spaces.
Pyrite, 30%, fine-grained, euhedral in nodules <5 mm.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, fine-grained, enriched on the outer surfaces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, euhedral, on outer surfaces, veins?
TEXTURAL DESCRIPTION: Semi-massive. Porosity 3%.
VEINS:
Size: 1-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Some dark silica clasts with very fine-grained pyrite.

Piece 3

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 85%, very fine-grained.
Pyrite, 15%, fine-grained, disseminated in silica.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, euhedral, in small open spaces.
TEXTURAL DESCRIPTION: Semi-massive. Porosity 3%.
ADDITIONAL COMMENTS: Two cm-sized very fine-grained fragments on both sides of a coarser quartz zone (vein?).



158-957E-8R-1

Piece 1

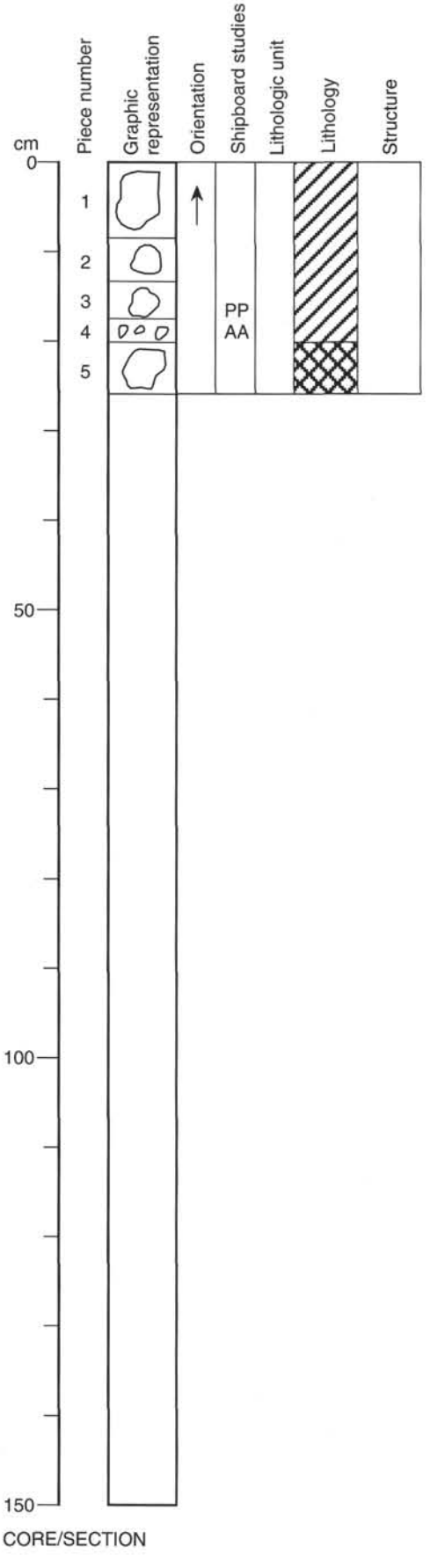
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Gray yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 93%, fine-grained, euhedral, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7%, fine-grained, interstitial to pyrite (vein?).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, filling pore spaces.
Anhydrite, fine-grained, euhedral, on broken surfaces.
Fe-oxide, very fine-grained, with silica filling pores in working half.
TEXTURAL DESCRIPTION: Massive recrystallized. Porosity 10%.
ADDITIONAL COMMENTS: Anhydrite on broken surfaces may be vein or breccia matrix.

Piece 2

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 70%, very fine-grained, matrix.
Pyrite, 30%, very fine-grained to fine-grained, 1- to 7-mm nodular clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, euhedral, interstitial in matrix, on broken surface.
TEXTURAL DESCRIPTION: Nodular, matrix supported. Porosity 5%.
ADDITIONAL COMMENTS: Some millimeter-sized dark silica clasts with very fine-grained pyrite.

Piece 3

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 77%, very fine-grained, in matrix, in silicified basalt clasts, in mm-sized vugs.
Pyrite, 20%, very fine-grained to fine-grained, disseminated in matrix and in silicified basalt clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%, fine-grained, interstitial to pyrite at center of 5-mm pyrite vein.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, euhedral, in small open spaces.
Fe-oxides, fine-grained, 2-mm patch in silicified basalt clast, and along margin of pyrite and chalcopyrite veins (working half).
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 12%.
VEINS:
Size: 5-mm veins.
Minerals: Pyrite and less chalcopyrite.
ADDITIONAL COMMENTS: 1- to 20-mm round to angular silicified basalt clasts in a silica plus pyrite matrix. 5-mm pyrite vein along two sides of piece. Part of silica is unusually dark with a different texture of pyrite.



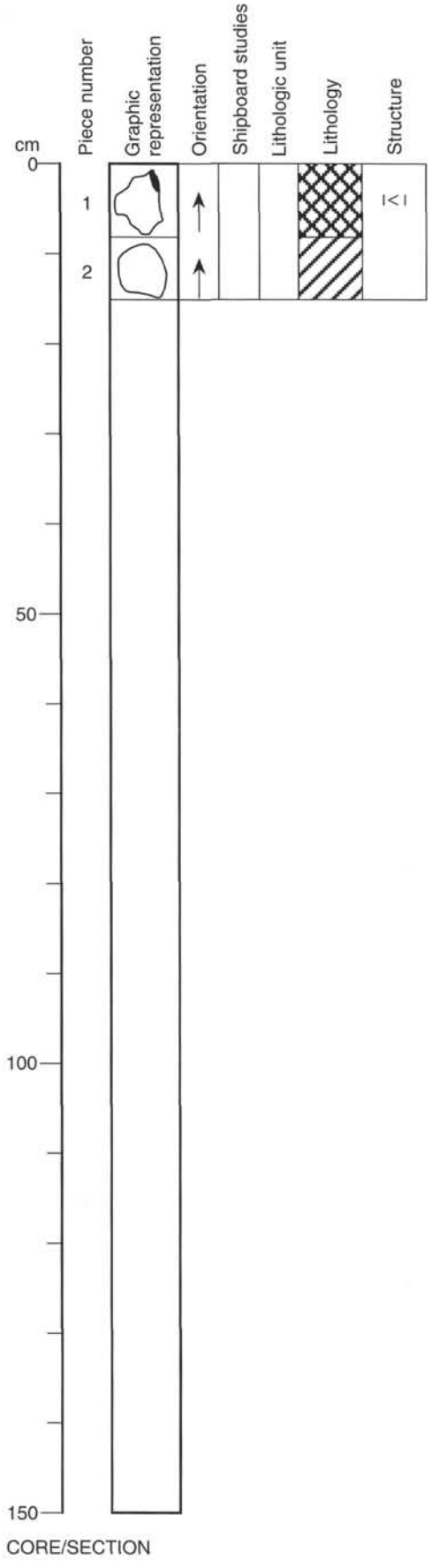
158-957E-9R-1

Pieces 1–4

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, fine- to medium-grained, massive granular, probably recrystallized.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 5%–10%, very fine- to fine-grained, dominantly silicified wallrock breccia fragments.
Chalcopyrite, 5%, fine- to medium-grained, intergrown with pyrite and rimming wallrock clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, medium-grained, vein related, <2-mm veins.
TEXTURAL DESCRIPTION: Massive granular pyrite with chalcopyrite as matrix to silicified wallrock fragments.

Piece 5

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: White, gray, brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 70%, very fine-grained to fine-grained, dominantly as silicified wallrock fragments.
Pyrite, 30%, fine- to coarse-grained, disseminated in silicified fragments and as veins up to 0.5 cm.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, interstitial to pyrite.
Hematite, fine-grained, in quartz-rich silicified wallrock fragments.
TEXTURAL DESCRIPTION: Coarse-grained, quartz-rich breccia.
ADDITIONAL COMMENTS: 20% of pyrite occurs as fine- to medium-grained disseminated aggregates in quartz-rich wallrock fragments, 80% of pyrite is in veins crosscutting breccia fragments.



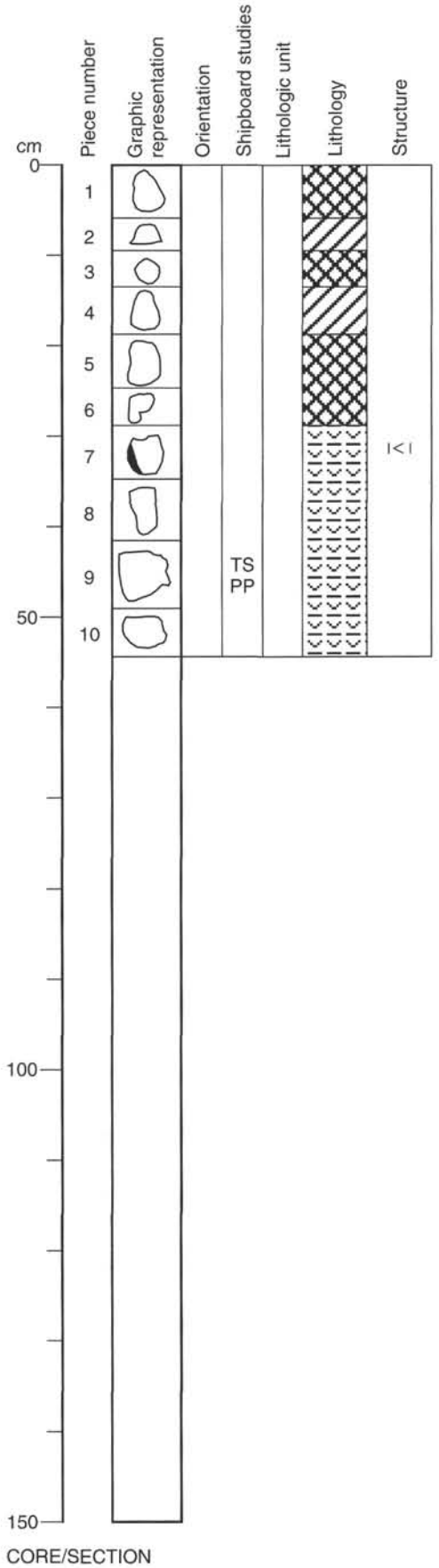
158-957E-10R-1

Piece 1

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 20%, fine-grained, disseminated, dominantly in quartz-rich wallrock; medium- to coarse-grained pyrite in 0.5-cm vein along margin of wallrock fragment.
Quartz, 80%, quartz-replaced wallrock fragment with abundant disseminated pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Hematite, in quartz-rich margin of siliceous fragment.
TEXTURAL DESCRIPTION: Fine-grained quartz and gray siliceous material; probable replaced wallrock fragment or pillow margin
ADDITIONAL COMMENTS: Probable quartz-replaced wallrock fragment, rimmed by pyrite vein. Most pyrite is present as uniformly disseminated fine-grained aggregates in silicified wallrock. Presence of hematite may indicate incorporation of interpillow chert along vein margins (see also Sample 158-957E-8R-1, Piece 3).

Piece 2

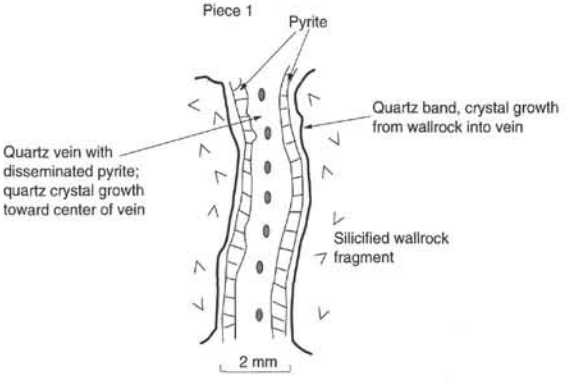
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, fine- to coarse-grained, euhedral grains, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 6%, fine-grained, as band or probable vein (up to 0.5 cm wide) crosscutting massive granular pyrite.
Anhydrite, 4%, medium- to coarse-grained, in late fractures and cavities.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Quartz, fine-grained, intergrown with pyrite.
Sphalerite, fine-grained, euhedral crystals lining small (<3 mm) cavities in crosscutting chalcopyrite vein.
TEXTURAL DESCRIPTION: Massive, coarse-grained pyrite.
VEINS: Possible veins (0.5 cm) of fine-grained (moderately porous) chalcopyrite cutting through massive granular pyrite.
ADDITIONAL COMMENTS: Dense, massive granular pyrite; very late anhydrite in fractures.



158-957E-11R-1

Pieces 1, 3, and 5–6

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Buff gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 75%–80%, vein, patches, silicified fragments.
Pyrite, 20%–35%, disseminated, pyrite-chalcopyrite and vein material.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, principally associated with veins.
Anhydrite, fine- to medium-grained, principally associated with veins.
Chlorite, very fine-grained, associated with altered wallrock fragments.
Hematite, very fine-grained, patches in quartz and clasts.
ADDITIONAL COMMENTS: Basalt wallrock fragments partially to completely silicified and veined by quartz and pyrite. Piece 5 contains small (<0.5 cm) fragments consisting of red chert (tentatively identified as hematitic interpillow chert). Piece 1 contains a quartz-pyrite vein (see sketch).



Pieces 2 and 4

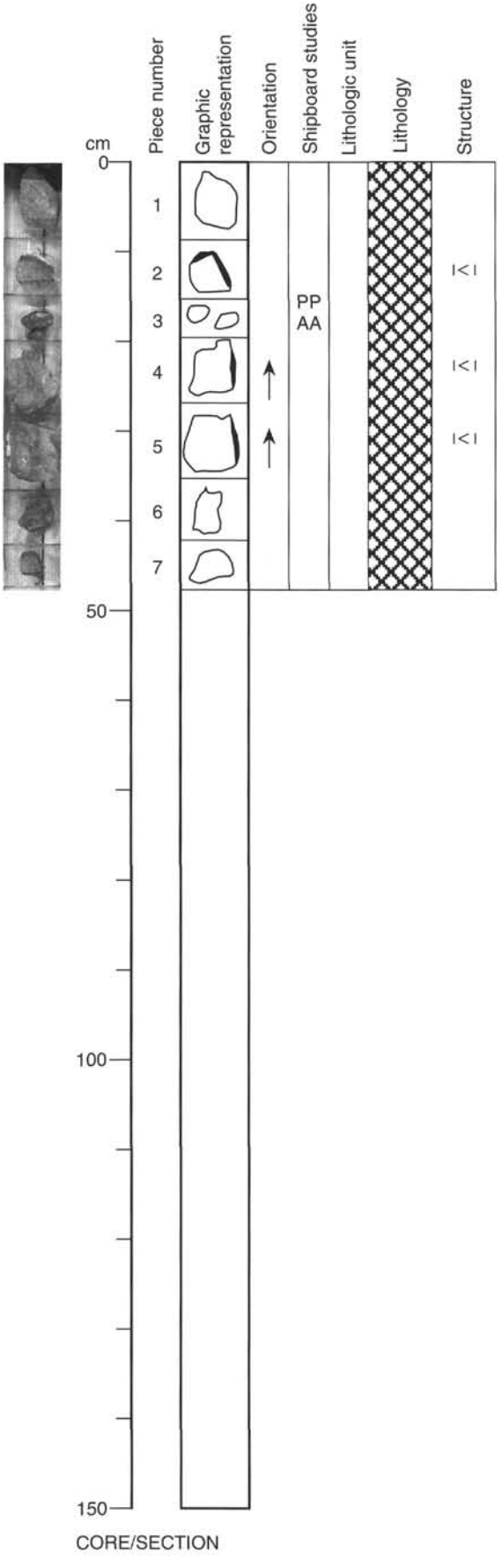
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine- to coarse-grained, euhedral, granular.
Quartz, 12%, very fine- to fine-grained, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, fine- to medium-grained, relics of veins and filling late open spaces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, very fine-grained, associated with anhydrite veins.
Chalcopyrite, fine- to medium-grained, associated with anhydrite veins.
TEXTURAL DESCRIPTION: Massive, granular.
ADDITIONAL COMMENTS: Piece 4: Quartz is more abundant on one side of the piece.

Pieces 7–10

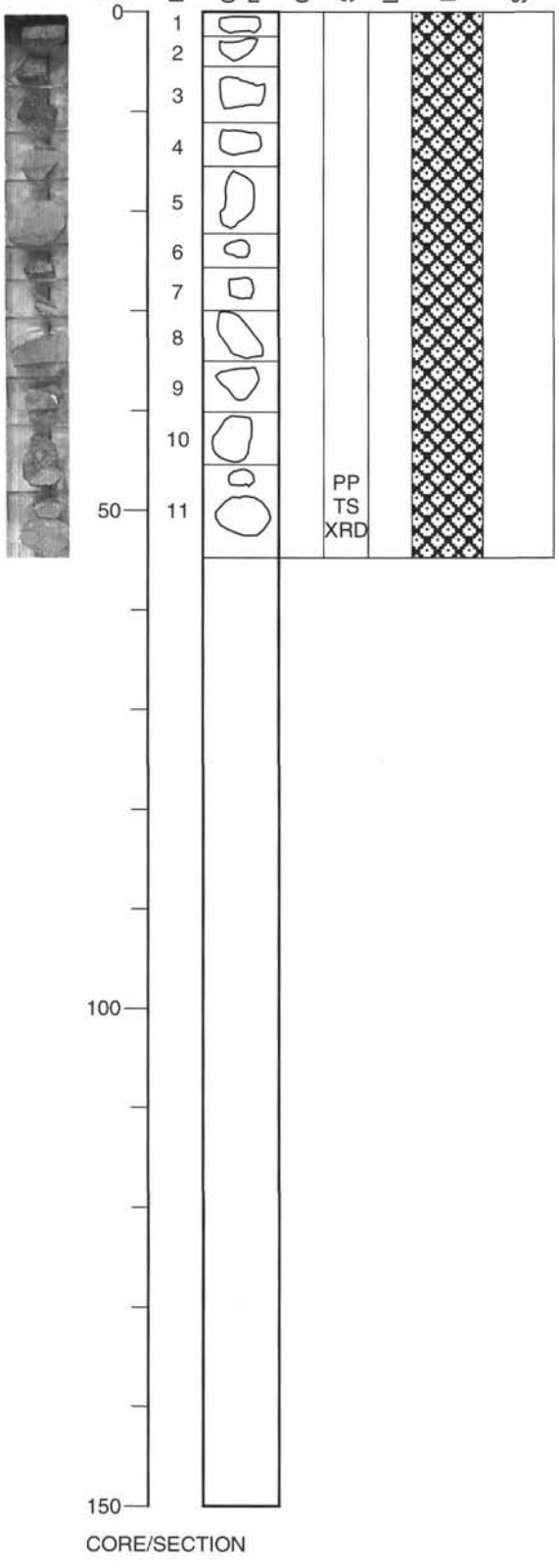
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Dark gray to brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 30%–40%, fine- to coarse-grained, euhedral to anhedral masses, disseminated aggregates and veins.
Quartz, 50%–60%, very fine- to fine-grained, subhedral, patches and matrix to breccia.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%–5%, fine- to medium-grained, anhedral masses and in veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to medium-grained, in veins.
TEXTURAL DESCRIPTION: Semi-massive pyrite, veined, clastic material.
ADDITIONAL COMMENTS: Individual pieces likely represent completely pyritized and silicified wallrock breccia fragments. Piece 7 is veined by pyrite-chalcopyrite-quartz (trace). Quartz-rich patches are rimmed by pyrite.

158-957E-12R-1

Pieces 1–7



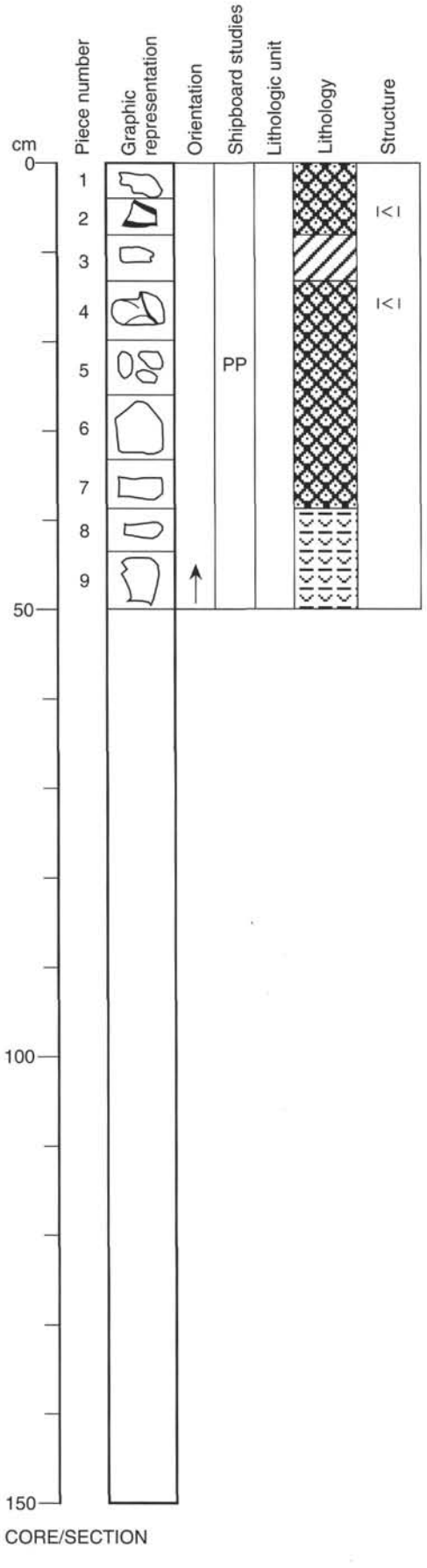
ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Dark gray and brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 25%–35%, fine- to medium-grained, disseminated in silicified wallrock fragments and as semi-massive aggregates along quartz and late anhydrite veins.
Quartz, 60%–70%, fine-grained matrix, patches, and vein-like quartz-rich zones.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, 0.5-cm-wide margin of anhydrite vein (Piece 2).
Anhydrite, fine-grained, as late veins and locally in late cavities.
Clay minerals, buff-colored alteration of basalt fragments.
TEXTURAL DESCRIPTION: Siliceous fragments up to 3 cm, veined by quartz, pyrite, and late anhydrite-pyrite-chalcopyrite, with widespread disseminated fine-grained pyrite.
VEINS: Piece 2: Incomplete anhydrite (20%)-pyrite (60%)-chalcopyrite (20%) vein at the margin of the fragments (width >1 cm), with inner anhydrite followed by chalcopyrite and with thick pyritic halo. Pieces 4 and 5: Complex vein matrix to basalt breccia consists of gray quartz (85%)-pyrite (15%) (width 3 cm) with isolated wallrock breccia fragments; coarse-grained pyrite is found disseminated throughout the vein. These are crosscut by white quartz-pyrite veins with coarse-grained pyritic margins (0.5 cm wide). One side of the piece consists of an incomplete anhydrite-pyrite-chalcopyrite vein.
Size: Conjugate fractures, mm-scale.
ADDITIONAL COMMENTS: Up to 20 discrete, 0.5–3 cm, buff-colored, altered basalt fragments in Pieces 1 through 7 (commonly fractured and mineralized by pyrite). Veins and patches of quartz surrounding and cutting through the fragments, are up to 1-cm wide (0.5–1 cm) and contain abundant fine-grained pyrite. Minor late anhydrite veins with pyrite-chalcopyrite halos cut the breccia. Piece 4 and, to a lesser extent Piece 5, have a well-developed conjugate fracture system with minor anhydrite filling them.



158-957E-14R-1

Pieces 1–11

ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
CLASTS
Quartz, 40%, very fine-grained, often enriched in a veinlet network with pyrite.
Clay minerals, 30%, very fine-grained, enriched between the veinlet network.
Pyrite, 30%, fine-grained, disseminated and enriched at the center of the veinlets.
MATRIX
Quartz, 50%, very fine-grained.
Pyrite, 50%, fine-grained.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
In matrix :
Anhydrite, trace to 1%, fine- to medium-grained in vugs.
Chalcopyrite, very fine-grained, with anhydrite at the outer part of 5-mm vein of dominantly chalcopyrite.
Chlorite, trace at the outer part of pieces.
Fe-oxides, as patches in Piece 7.
TEXTURAL DESCRIPTION: Matrix-supported breccia. Porosity 5%.
VEINS:
Piece 5: One white quartz (50%)-pyrite (50%) vein (width 1 cm) with diffuse boundary to altered clast. Pyrite occurs as granular masses throughout the vein. An 0.4-cm offshoot from this vein continues into a wallrock fragment.
Piece 8: White quartz (90%)-pyrite (10%) vein (width 0.5 cm). Quartz is fine-grained, banded, and pyrite occurs dominantly at margins.
Piece 10: A 2-cm-wide vein consisting of gray quartz (85%) and pyrite (15%). Coarse-grained pyrite occurs along the margins of the vein whereas fine-grained pyrite is found throughout the vein. The vein contains wallrock fragments and some chalcopyrite superimposed from the adjacent anhydrite vein. This incomplete, marginal anhydrite vein (width >1 cm) with abundant pyrite and chalcopyrite is crosscutting all other vein types and shows a buff-colored alteration halo.
Piece 11: Gray quartz (80%)-pyrite (20%) vein with pyrite dominantly as coarse-grained granular aggregates at the margins of the vein. Wallrock fragments are in the vein. This vein does not seem as dark as other veins (bleached?).
ADDITIONAL COMMENTS: About 40% of clasts are centimeter sized, two fragments > 5 cm (Pieces 5 and 11). A dark green mineral occurs on the outer part of Piece 11 (chlorite?). The proportion of basalt clasts increases relative to previous sections. Piece 7 contains up to 10% by volume of hematite.



158-957E-15R-1

Pieces 1–2 and 4–7

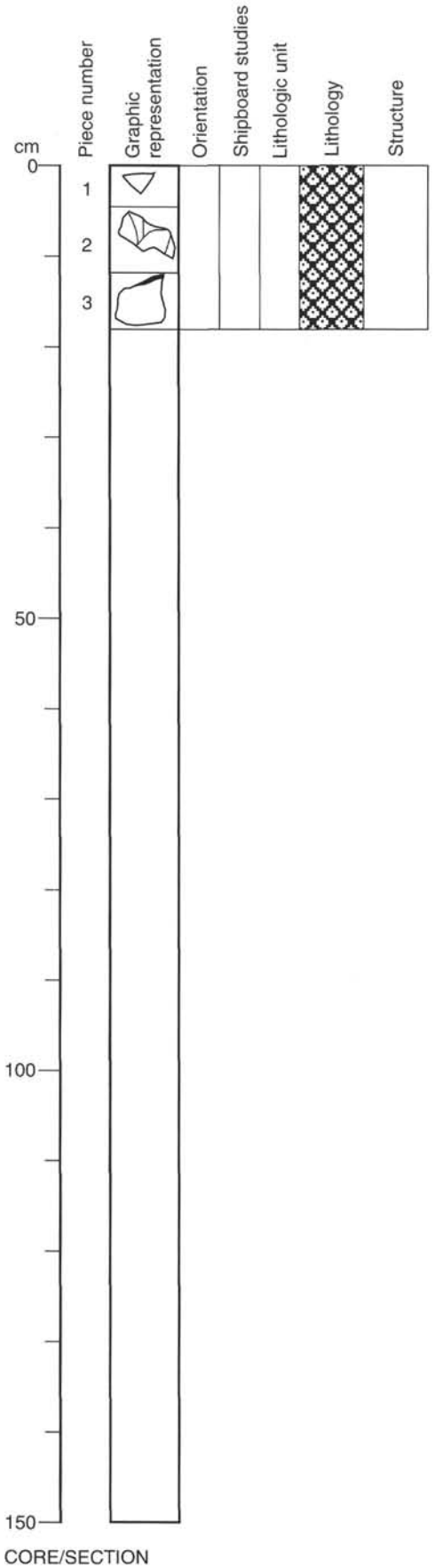
ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
CLASTS
Quartz, 60%, very fine-grained, replacing basalt with clay minerals.
Clay minerals, 10%, very fine-grained, residual at the center of altered basalt clasts.
Pyrite, 30%, disseminated.
MATRIX
Quartz, 50%, very fine-grained, cement around clasts, white to dark gray.
Pyrite, 50%, very fine- to fine-grained, disseminated in white to dark gray silica.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 1%–2%, fine-grained, euhedral, as veins at the outer part of pieces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, more abundant on outer surfaces with anhydrite.
TEXTURAL DESCRIPTION: Matrix-supported breccia for Piece 6. Porosity 5%.
VEINS: Piece 1 shows a 0.5-cm-wide gray quartz (90%)-pyrite (10%) vein with diffuse margins to the wallrock and a coarse-grained pyritic halo around the vein. A late marginal anhydrite-pyrite-chalcopyrite vein with a buff-colored alteration halo also occurs. Piece 2: Small (0.3-cm-wide) veinlets of white quartz (20%) and pyrite (80%) showing abundant open space are developed. Pyrite is dominantly found along the margins of the vein. It is possible that quartz is filling an earlier pyrite vein. Two marginal anhydrite-pyrite-chalcopyrite veins with buff-colored alteration halos are crosscutting all other vein types. In Piece 4, diffuse areas >2 cm in width are thought to be veins of gray quartz (75%)-pyrite (25%) adjacent to altered basalt. A single vein of white quartz (80%) and pyrite (20%) with a width of 0.4 cm shows pyrite at the margins of the vein and has less open space than veins in pieces described above.
ADDITIONAL COMMENTS: 60% altered basalt, silica cement unusually dark gray. Anhydrite coating on surfaces of some fragments (Piece 2). The real proportion of late anhydrite veins is not known. The drilling was very fast in soft material, anhydrite veins(?). Pieces 6 and 7 are matrix only; they do not contain clasts of altered basalt. Piece 4 shows Fe-oxide as small red arcuate band.

Piece 3

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 63%, fine-grained, euhedral.
Chalcopyrite, 25%, fine-grained, interstitial.
Quartz, 10%, very fine-grained, disseminated filling pores.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 2%, fine-grained, euhedral, late on outer surfaces.
TEXTURAL DESCRIPTION: Porosity 10%.

Pieces 8–9

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 60%, very fine-grained, matrix.
Pyrite, 37%, very fine- to fine-grained, disseminated and as cm-sized nodules.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, fine-grained, euhedral, in open space and as veins at the outer part of pieces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, very fine-grained, at surface on Piece 8.
Chalcopyrite, fine-grained, more abundant on outer surfaces with anhydrite.
TEXTURAL DESCRIPTION: Matrix-supported breccia. Porosity 5%.



158-957E-16R-1

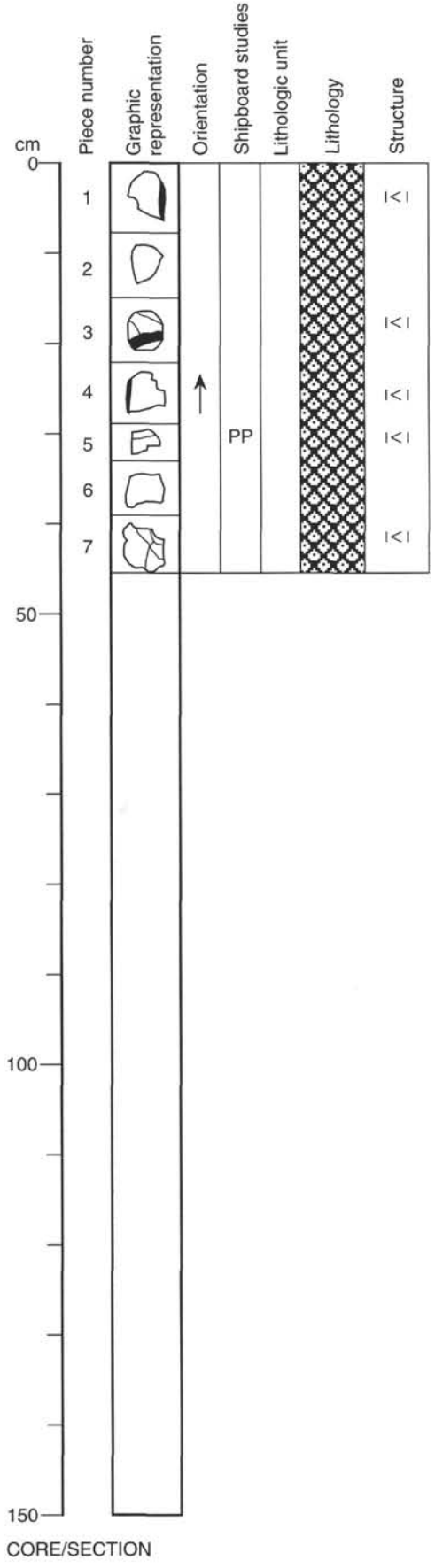
Pieces 1–2

ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 40%, very fine-grained, replacing basalt in 0.1- to 0.2-mm veins.
Chlorite, 30%, very fine-grained, replacing basalt.
Pyrite, 20%, very fine- to fine-grained, disseminated in basalt, along the wall and the center of the veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine-grained, euhedral, in 2-mm veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, in margin of anhydrite veins.
TEXTURAL DESCRIPTION: Clast-supported breccia. Porosity 5%.
VEINS: Piece 2: Three different vein types are present. Four quartz (70%)-pyrite (30%) veins (width 0.5 cm) with subtle, dark alteration halos occur. They are locally intersecting with remnant cavities, and some of them show traces of hematite. Several microveinlets of pyrite are crosscutting the wallrock fragments. This piece is rimmed by an anhydrite-pyrite-chalcopyrite vein with a buff-colored alteration halo that is crosscutting all other vein types.
Size: 1–2 mm.
Minerals: Quartz, anhydrite, pyrite.

Piece 3

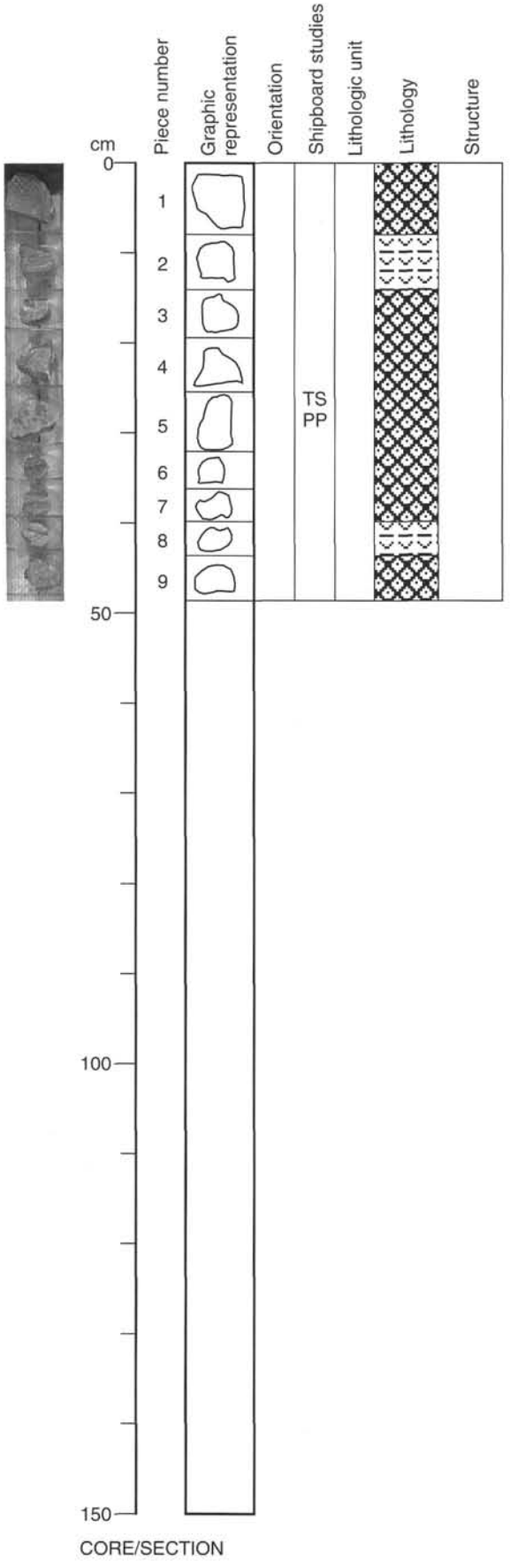
ROCK TYPE: CHLORITIZED BASALT BRECCIA WITH PYRITE HALO (Type 10b)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 69%, very fine- to fine-grained, euhedral, aggregates.
Quartz, 20%, very fine-grained, cementing basalt clasts, in pores of massive pyrite.
Chlorite, 8%, very fine-grained, replacing basalt clast.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 3%, fine-grained, on broken surfaces (vein?).
Anhydrite, 5%, fine- to medium-grained, euhedral, in vugs and on broken surfaces (vein?).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
White clay, very fine-grained, in altered basalt clasts.
TEXTURAL DESCRIPTION: Pyrite vein plus chloritized basalt selvege. Porosity 12%.
ADDITIONAL COMMENTS: Main portion of the sample is pyrite plus quartz, which is probably a vein. The chloritized basalt clasts cemented by quartz are probably the wallrock of the vein.

158-957E-17R-1



Pieces 1–7

ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 40%, very fine-grained, replacing basalt, in veins cutting basalt.
Chlorite, 40%, very fine-grained, replacing basalt.
Pyrite, 20%, very fine- to medium-grained, disseminated in basalt, crosscutting basalt in veins with quartz.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 5%, fine- to coarse-grained, euhedral, in veins on exposed broken surfaces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, in anhydrite veins with pyrite.
Unidentified colorless mineral, fine-grained, euhedral, prismatic, in Piece 3.
TEXTURAL DESCRIPTION: Clast-supported breccia. Porosity 7%.
VEINS: Several vein types have been found in these samples. Dark gray quartz-pyrite veins (1–2 cm wide) with disseminated fine- to medium-grained pyrite are the first set of veins surrounding basaltic fragments. They contain 40%–75% quartz, 25%–50% pyrite, and rare chalcopyrite. These veins develop 0.3- to 0.5-cm-wide pyritic margins and buff-colored alteration halos in the basaltic fragments. A network of pyrite-dominated microveinlets is developed throughout the margins and cores of wallrock fragments and seem also to cut the dark gray quartz-pyrite veins. They contain minor quartz and are <0.1 cm wide. Dark gray selvages are present. In Piece 4 they occur on fractures of concentric margins of pillow fragments. *White quartz-pyrite veins (0.3–1 cm wide, often* branching) with pyrite (40%–60%) at the center and quartz (60%–40%) along the margins formed later. Anhydrite-pyrite-chalcopyrite veins (<0.5 cm wide) crosscut all other vein types and are commonly found marginal to the samples. They also produce a buff-colored alteration halo in basaltic wallrock fragments.
ADDITIONAL COMMENTS: Zoned alteration around veins: 1- to 5-mm-wide gray chlorite alteration zone close to veins, green chloritic alteration farther from vein. 30% of basalt shows green chloritic alteration, 70% shows gray chloritic alteration. Piece 2 contains fractured clasts with the fractures filled with chlorite.



158-957E-18R-1

Piece 1

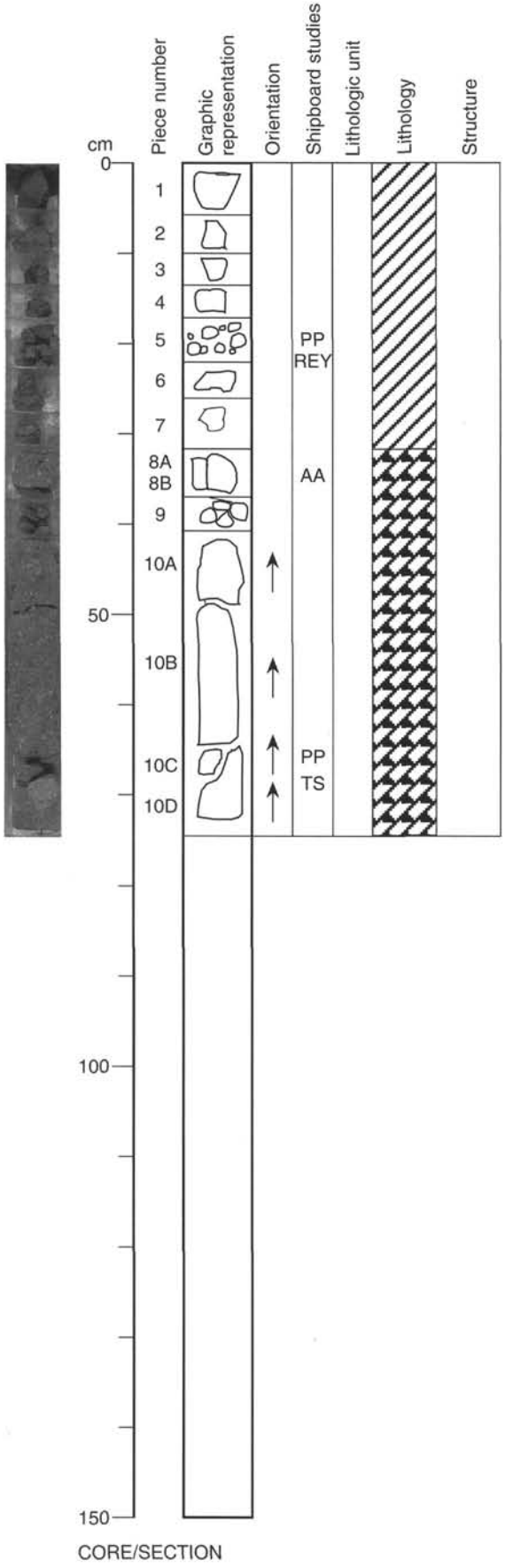
ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: Vein contact.
COLOR: Light olive green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chlorite, 80%, very fine-grained, complete alteration of basalt.
Pyrite, 15%, fine- to medium-grained, euhedral, in veins and minor disseminations with chlorite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 5%, very fine- to fine-grained, in pyrite veins and in veins by itself.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to medium-grained, in veins.
TEXTURAL DESCRIPTION: Pervasive chloritization of moderately phyric basalt.
VEINS: Several 0.1- to 0.2-cm-wide veins of white quartz (80%) and pyrite (20%) are dominantly filling late fractures in a coarse, weakly mineralized basalt fragment. A massive pyrite vein (1 cm wide, 90% pyrite) with a thin white quartz margin (2 mm wide, 10% quartz) is present adjacent to a basalt clast. A late anhydrite-pyrite vein occurs marginally and seems to occupy the same fracture as the massive pyrite vein.
ADDITIONAL COMMENTS: Olivine phenocryst and plagioclase microlite relics are present.

Pieces 2 and 8

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None observed.
COLOR: Brassy yellow and dark gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine- to medium-grained, euhedral to anhedral, semi-massive to massive aggregates and disseminations.
Quartz, 40%, very fine- to fine-grained, matrix and veins (gray quartz in matrix, white quartz in veins).
Clay minerals, 10%, very fine-grained, in basalt fragments.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, fine-grained, associated with quartz matrix.
Anhydrite, fine- to coarse-grained, occurs in veins.
Chalcopyrite, fine-grained, occurs in anhydrite vein selvage.
TEXTURAL DESCRIPTION: Brecciated, massive pyrite clasts, disseminated by pyrite throughout quartz matrix, veined.
VEINS: Piece 2: Vein types observed include two white quartz veins (0.3–0.4 cm wide) crosscutting strongly mineralized basalt fragments and massive pyrite and a marginal anhydrite-pyrite vein. Piece 8: Network of quartz veins (0.3–0.5 cm wide, 90% quartz) with very fine-grained pyrite in a quartz matrix. Pyrite is coarser grained at the margins. These veins crosscut basalt fragments and develop a 2-mm, dark green quartz-chlorite selvage. Chlorite is also intergrown with pyrite inside the margin of the vein.

Pieces 3–7 and 9

ROCK TYPE: CHLORITIZED BASALT BRECCIA (Type 10b)
CONTACTS: None.
COLOR: Brassy yellow and dark green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chlorite, 60%, very fine- to fine-grained, pervasive alteration of basalt and in discrete veins.
Pyrite, 25%, fine- to coarse-grained, euhedral to anhedral, veins and disseminations.
Quartz, 15%, fine-grained, in veins with pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to coarse-grained, in pyrite-quartz veins.
Chalcopyrite, fine- to medium-grained, in pyrite-quartz veins.
TEXTURAL DESCRIPTION: Breccia, veined, highly altered.
VEINS: Microveinlets (0.1 mm wide), in places with thin buff-colored halos, commonly in fractures of chloritized basalt. White quartz veins (0.1–0.5 cm wide, 80%–100% quartz, 0%–20% pyrite) with a 2-mm, dark green quartz-chlorite selvage are crosscutting chloritized basalt fragments and semi-massive pyrite. Chlorite is also intergrown with pyrite inside the margin of the vein. Slightly coarser grained pyrite aggregates are developed at the margins of the veins. Late anhydrite-pyrite veins (0.5 cm wide) in places with thick pyritic halos are crosscutting all other vein types. Piece 5 consists of a quartz-chlorite vein assemblage as matrix to buff-colored basalt clasts. A 0.2-cm massive medium-grained pyrite vein is present in Piece 7. In Piece 9 the matrix to chloritized basalt fragment consists of 1- to 2-cm-wide pyrite-white quartz veins (60% pyrite, 40% quartz) with abundant coarse-grained granular pyrite and a minor chloritic halo. This pyrite is possibly the halo of an adjacent anhydrite vein.



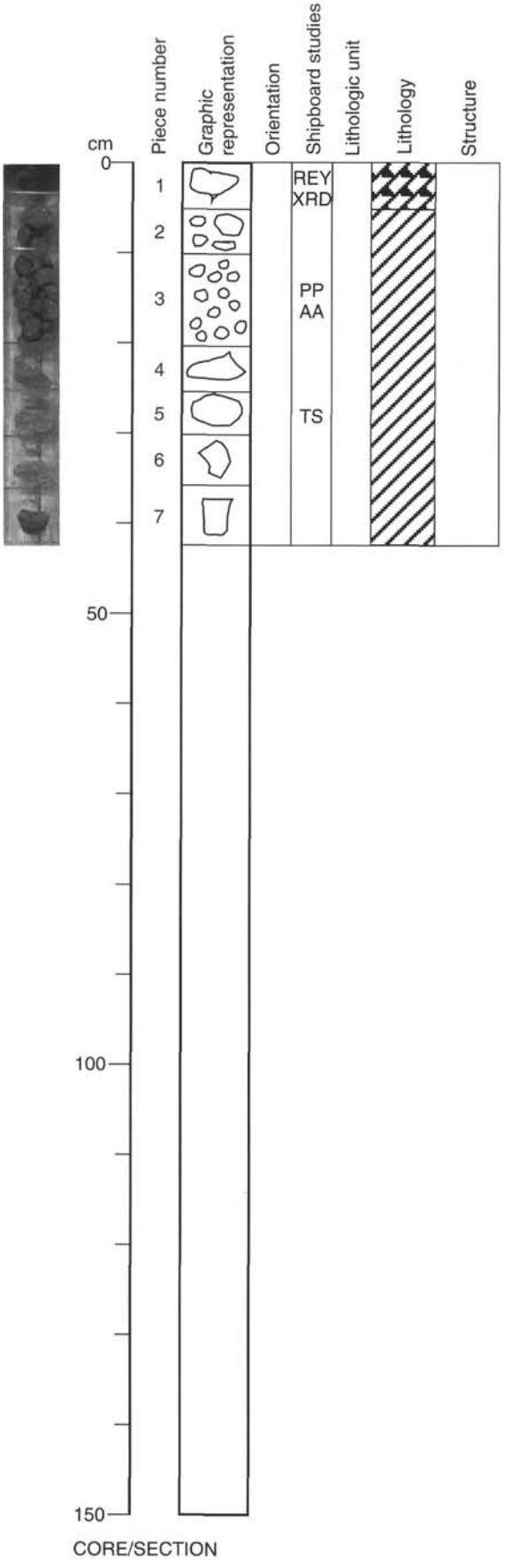
158-957F-1N-1

Pieces 1–7

ROCK TYPE: MASSIVE GRANULAR CHALCOPYRITE (Type 5d)
CONTACTS: None.
COLOR: Brassy, gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chalcopyrite, 60%, medium- to coarse-grained, euhedral.
Pyrite, 30%, fine- to medium-grained, subhedral to euhedral.
Marcasite, 10%, fine- to medium-grained, fibrous, elongate grains.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to medium-grained.
Sphalerite, fine-grained.
TEXTURAL DESCRIPTION: Massive chalcopyrite, pyrite, and marcasite chimney pieces.
ADDITIONAL COMMENTS: Fragments of chimneys and chimney orifices. Pieces 6 and 7 logged as massive granular pyrite.

Pieces 8A–10D

ROCK TYPE: POROUS, NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Brassy green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine- to coarse-grained, subhedral to euhedral, occurs in clasts and disseminated in matrix.
Anhydrite, 10%, fine- to medium-grained, matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, angular clasts.
TEXTURAL DESCRIPTION: Massive, porous, nodular, breccia.
ADDITIONAL COMMENTS: Contains angular clasts of massive chalcopyrite.



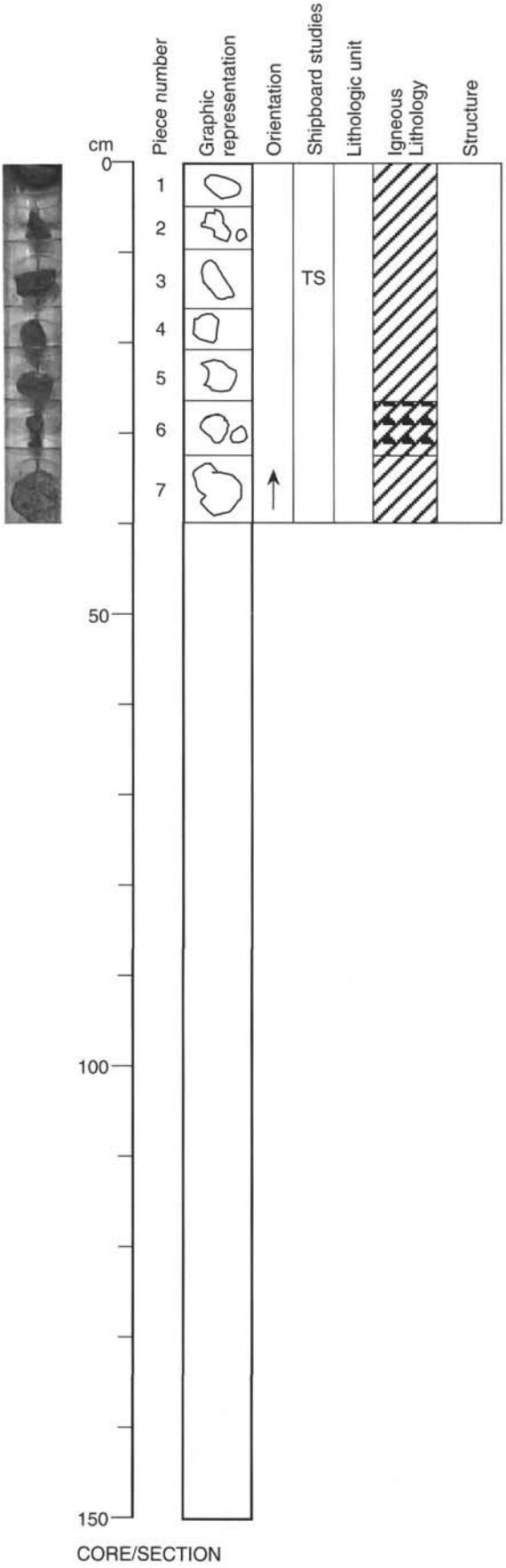
158-957F-2N-1

Piece 1

ROCK TYPE: MASSIVE PYRITE BRECCIA (Type 6)
CONTACTS: None.
COLOR: Dark gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, marcasite, 85%, fine- to very fine-grained, sandy, brecciated fragments in very fine-grained pyritic matrix.
Chalcopyrite, 10%, fine-grained, sandy material.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Sphalerite, 5%, dendritic.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxides, thin botryoidal coating on oxidized surface.
Sooty material, probable amorphous, secondary Fe-sulfides associated with oxidation of pyrite.
Silica, filaments.
TEXTURAL DESCRIPTION: Fine breccia, probable fine-grained pyritic matrix; possible cemented sulfide sand.
ADDITIONAL COMMENTS: Fine-grained fragmental or clastic sulfide debris; partially oxidized with surface coating of waxy brown Fe-oxides. Sooty black material typical of oxidized pyrite. Layering probably related to sedimentation.

Pieces 2–7

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%–95%, medium- to coarse-grained, granular aggregates.
Chalcopyrite, 5%–35%, fine-grained, interstitial to pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, trace to 8%, medium-grained, filling pore spaces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Quartz, very fine-grained.
TEXTURAL DESCRIPTION: Massive granular, hard, dense, and partially recrystallized.
ADDITIONAL COMMENTS: Relict colloform structures/texture of massive pyrite in cores of some fragments, partially replaced by chalcopyrite. Possibly clasts from porous pyrite breccia, as in Section 158-957F-1N-1.



158-957G-1N-1

Pieces 1, 3–5, and 7

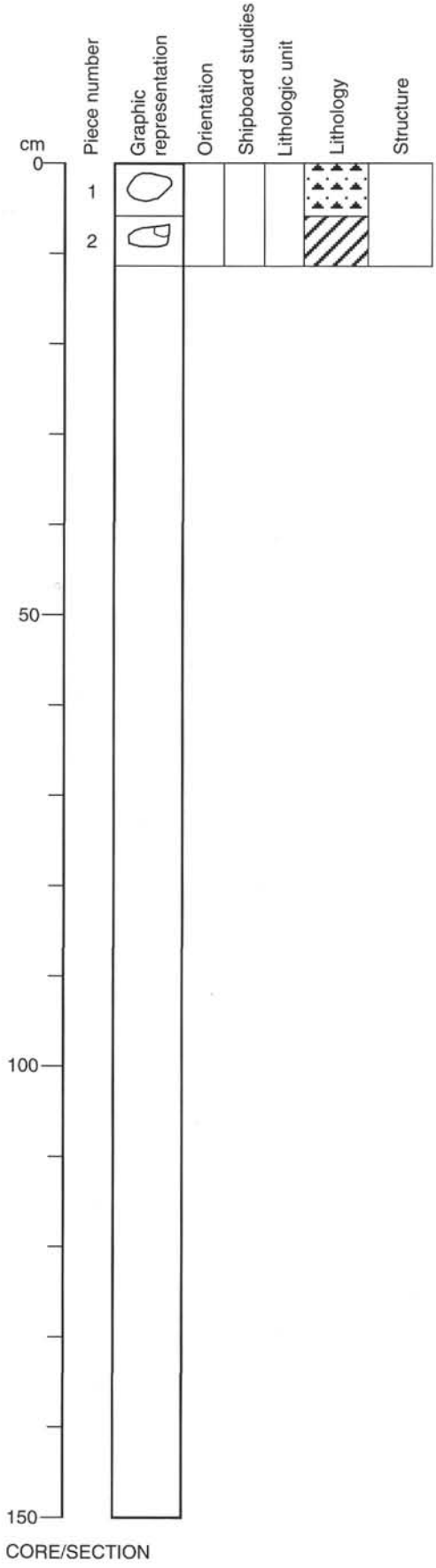
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%–90%, very fine- to medium-grained, euhedral and colloform, some banding.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, very fine- to fine-grained, some local enrichment in massive pyrite, also in part of the "clasts."
Silica, trace to 5%, very fine-grained, locally filling pore spaces.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, very fine- to coarse-grained, filling small veinlets, coarser aggregates at the outer part of samples.
TEXTURAL DESCRIPTION: Vermicular shape suggests recrystallized colloform texture. Piece 3 exhibits colloform bands. Pore space 7%.
ADDITIONAL COMMENTS: Some tarnish at the surface of chalcopyrite. Pieces 1, 4, and 5 could be clasts in nodular pyrite-silica breccia. Chalcopyrite and anhydrite are mainly at the outer part of pieces.

Piece 2

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, very fine-grained, colloform.
Chalcopyrite, 25%, very fine-grained, subhedral, bladed.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, globules in pores.
TEXTURAL DESCRIPTION: Pore space 15%.
ADDITIONAL COMMENTS: Possibly primary precipitates.

Piece 6

ROCK TYPE: POROUS NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 88%, very fine-grained, subhedral to euhedral.
Anhydrite, 10%, very fine-grained, filling small veinlets.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, disseminated in pyrite.
Silica, very fine-grained.
TEXTURAL DESCRIPTION: Pore space 20%.
VEINS:
Size: 1-mm veins.
Orientation: Form a crosscutting network.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: May be the matrix of the porous massive pyrite clasts (Pieces 1, 3–5, and 7).



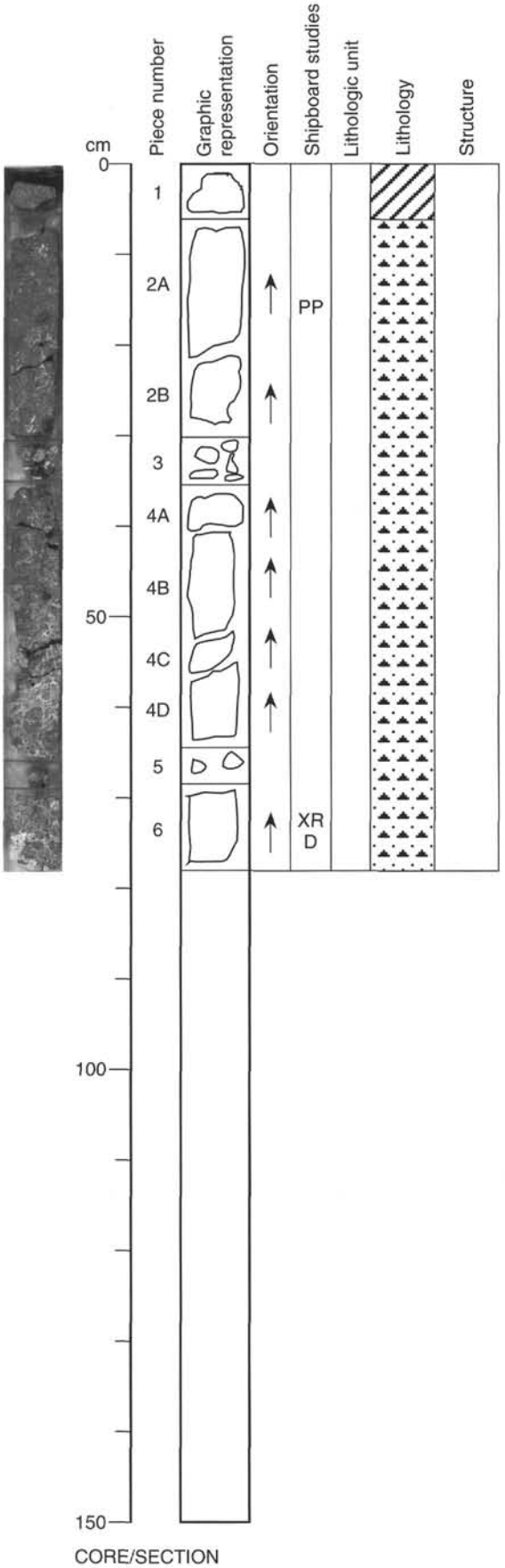
158-957G-2N-1

Piece 1

ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Morphology, Characteristics
Pyrite, 72%, fine-grained, in 0.5- to 10-mm nodules.
Anhydrite, 20%, fine- to medium-grained, euhedral matrix material.
MINOR MINERALS:
Name, Abundance (%), Included in, Characteristics
Chalcopyrite, 7%, very fine-grained, interstitial, rims around pyrite nodules.
TRACE MINERALS (<2%):
Name, Abundance (%), Included in, Characteristics
Slica, very fine-grained, locally as 1-mm clasts.
TEXTURAL DESCRIPTION: Clast-supported, nodular. Porosity 7%.

Piece 2

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c) WITH SILICIFIED BASALT CLASTS
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Morphology, Characteristics
Pyrite, 83%, fine- to very fine-grained, colloform to euhedral.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Silica, 15%, very fine-grained, interstitial and in 1-cm silicified basalt clast.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, on exposed fragment surfaces of working half and interstitial.
Chalcopyrite, very fine-grained, interstitial.
TEXTURAL DESCRIPTION: Massive, with basalt clast. Porosity 7%.
ADDITIONAL COMMENTS: Probable clast from pyrite anhydrite breccia. Contains 1-cm silicified basalt clast.



158-957G-3N-1

Piece 1

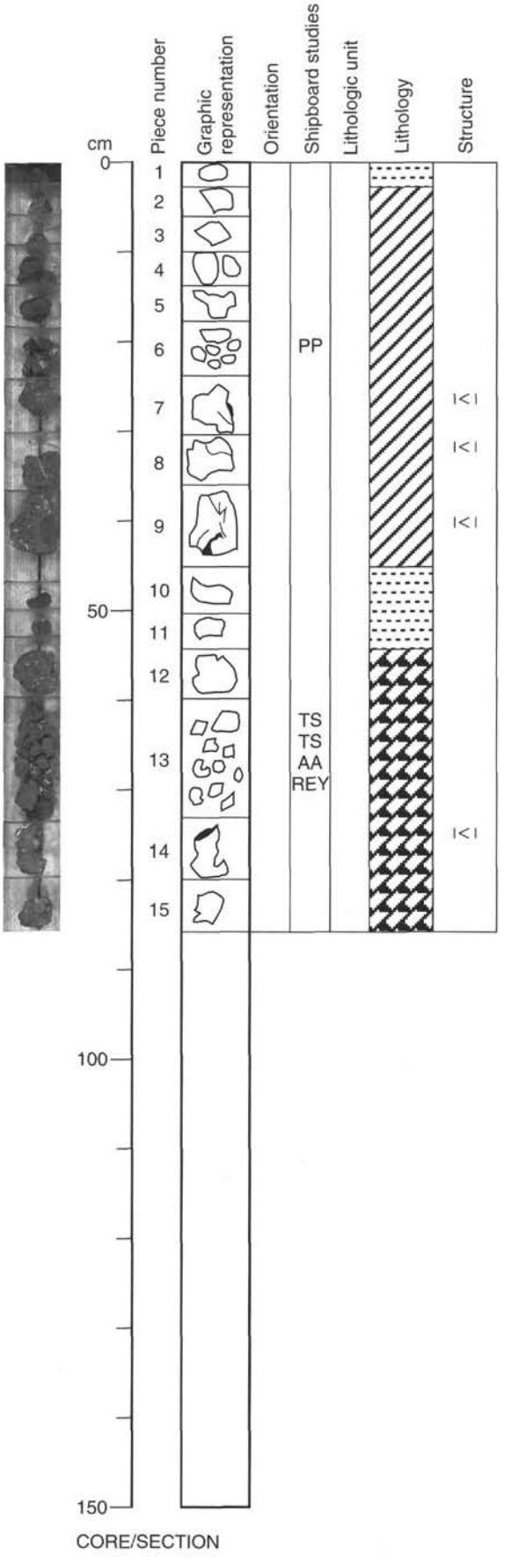
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine- to medium-grained, granular.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 5%, very fine-grained, matrix in pyrite-silica clast.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, intergrown with pyrite.
ADDITIONAL COMMENTS: Single pyrite-silica clast (1 cm wide).

Pieces 2A–3

ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Yellow green and white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, fine- to medium-grained, clastic, colloform.
Anhydrite, 15%, medium- to coarse-grained, veins, rosettes.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 10%, fine- to medium-grained.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, matrix in pyrite-silica clasts.
TEXTURAL DESCRIPTION: Fragments of chalcopyrite-rich pyrite in medium- to coarse-grained anhydrite matrix. Chalcopyrite occurs in the core of pyrite but also rims pyrite fragments. Few pyrite-silica clasts *(few millimeters in diameter) always rimmed by pyrite.*
ADDITIONAL COMMENTS: Brecciated pyrite is locally nodular and grades downward into nodular, siliceous pyrite-anhydrite breccia.

Pieces 4A–6

ROCK TYPE: NODULAR SILICEOUS PYRITE-ANHYDRITE BRECCIA (Type 7c)
CONTACTS: With anhydrite vein at 73 cm.
COLOR: White and yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, fine- to medium-grained, nodular.
Anhydrite, 40%, fine- to coarse-grained, veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 8%, matrix in pyrite-silica clasts and wallrock clasts.
Chalcopyrite, 2%, very fine-grained, intergrown with pyrite in massive pyrite clasts, disseminated.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, very fine-grained, few clasts, from 1 to 5 mm in diameter.
TEXTURAL DESCRIPTION: Nodular massive pyrite, pyrite-silica, and siliceous wallrock breccia clasts in anhydrite matrix.
VEINS:
Size: 1 cm veins.
Orientation: Irregular.
Minerals: Anhydrite at bottom of Piece 6.
ADDITIONAL COMMENTS: *Chalcopyrite is enriched in massive pyrite clasts and more abundant and* disseminated close to anhydrite vein in Piece 6. Some pyrite-silica clasts are angular whereas the rest are subangular. Clasts are rimmed with anhydrite. A strongly silicified clast with patches of white silica occurs in Piece 4D.



158-957H-1N-1

Piece 1

ROCK TYPE: GRAY CHERT (Type 3)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 75%, very fine-grained, dense, massive.
Pyrite, 25%, fine-grained, disseminated in chert, in vugs.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, associated with anhydrite on broken surface (vein?) and in vugs.
Anhydrite, fine-grained, coating broken surface, euhedral (vein).
TEXTURAL DESCRIPTION: Dense chert. Porosity 2%.
VEINS:
Size: 0.5-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Dense gray chert with disseminated pyrite. Pyrite and chalcopyrite in vugs. Very fine euhedral quartz in vugs.

Pieces 2 and 3

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Gray yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite,100%, fine-grained, euhedral.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Unidentified black blue coating on one surface, 0.5 mm thick, perhaps covellite.
TEXTURAL DESCRIPTION: Massive. Porosity 10%.

Pieces 4–9

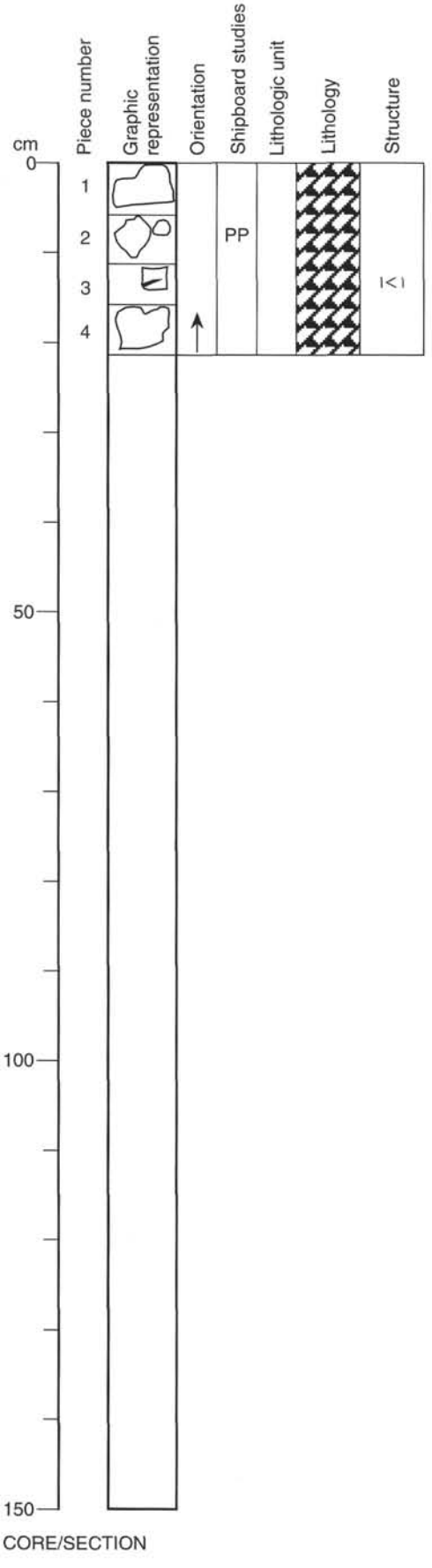
ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, very fine- to fine-grained, euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 8%, euhedral, filling pores, 1- to 2-mm veins.
Chalcopyrite, 7%, fine-grained, most abundant in Piece 9.
TEXTURAL DESCRIPTION: Porous, massive, granular. Porosity 20%.
VEINS:
Size: 2-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Primary porous sulfide precipitation textures veined with anhydrite and with anhydrite locally filling pores.

Pieces 10–11

ROCK TYPE: RED CHERT (Type 2)
CONTACTS: None.
COLOR: Red.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Red silica, 70%, very fine-grained, massive, dense chert.
Fe-oxide, 27%, very fine-grained, intergrown with silica.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 3%, fine-grained, euhedral, disseminated.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, on broken surfaces.
TEXTURAL DESCRIPTION: Porosity 3%.
VEINS:
Size: 2-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Dense red chert with disseminated pyrite.

Pieces 12–15

ROCK TYPE: POROUS NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 83%, euhedral, single grains and up to 5-mm aggregates.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7%, fine-grained, euhedral, crystals and aggregates up to 3 mm.
Anhydrite, 10%, euhedral , fine-grained, cementing pyrite, in vugs and 2-mm veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, on broken surfaces.
TEXTURAL DESCRIPTION: Porosity 20%.
VEINS:
Size: 2-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Porous nodular pyrite breccia veined and cemented by anhydrite.

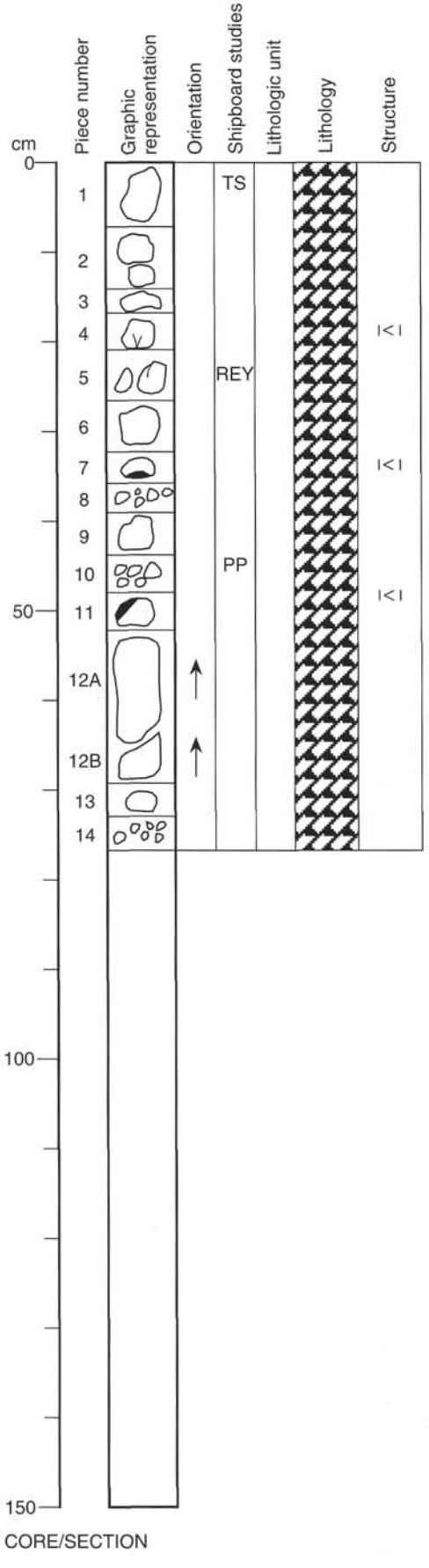


158-957H-2N-1

Pieces 1–4

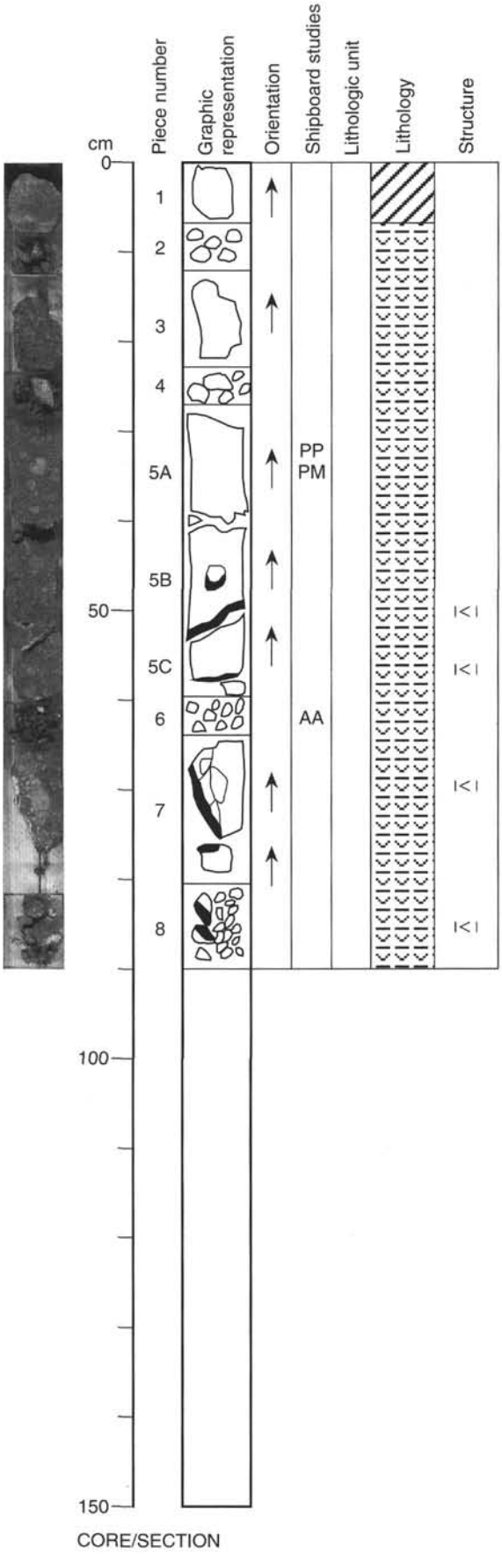
ROCK TYPE: POROUS NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 88%,
Clasts: very fine- to medium-grained, euhedral, coarsely crystalline aggregates.
Matrix: very fine- to fine-grained, euhedral.
Anhydrite,10%, fine-grained, coarse-grained in the veins, euhedral, veins and cement in pyrite matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, very fine-grained, interstitial in pyrite matrix.
TEXTURAL DESCRIPTION: Porous, massive, granular. Porosity-clasts 5%, matrix 20%
VEINS:
Size: 0.5- to 2-mm-wide veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Anhydrite vein, only in Piece 3. Most clasts are massive granular pyrite (Type 5c). Clasts are up to 5 cm in Piece 4.

158-957H-3N-1



Pieces 1–14

ROCK TYPE: POROUS NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Brassy yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%–95%, fine- to coarse-grained, euhedral to anhedral, massive nodular clasts and fine-grained pyrite sand-anhydrite matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%–10%, fine- to coarse-grained, euhedral, matrix, in places vein related.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, trace to 3%, fine- to medium-grained, nodular clasts and vein related.
TEXTURAL DESCRIPTION: Massive, often nodular, pyrite clasts occur in an anhydrite-pyrite matrix. Chalcopyrite nodules are present.
VEINS:
Size: 3- to 5-mm veins.
Orientation: Irregular.
Minerals: Chalcopyrite and anhydrite.
ADDITIONAL COMMENTS: Piece 1: Network of interconnecting channelways in porous pyrite breccia. Chalcopyrite and anhydrite appear in veins (especially Pieces 6 and 11).



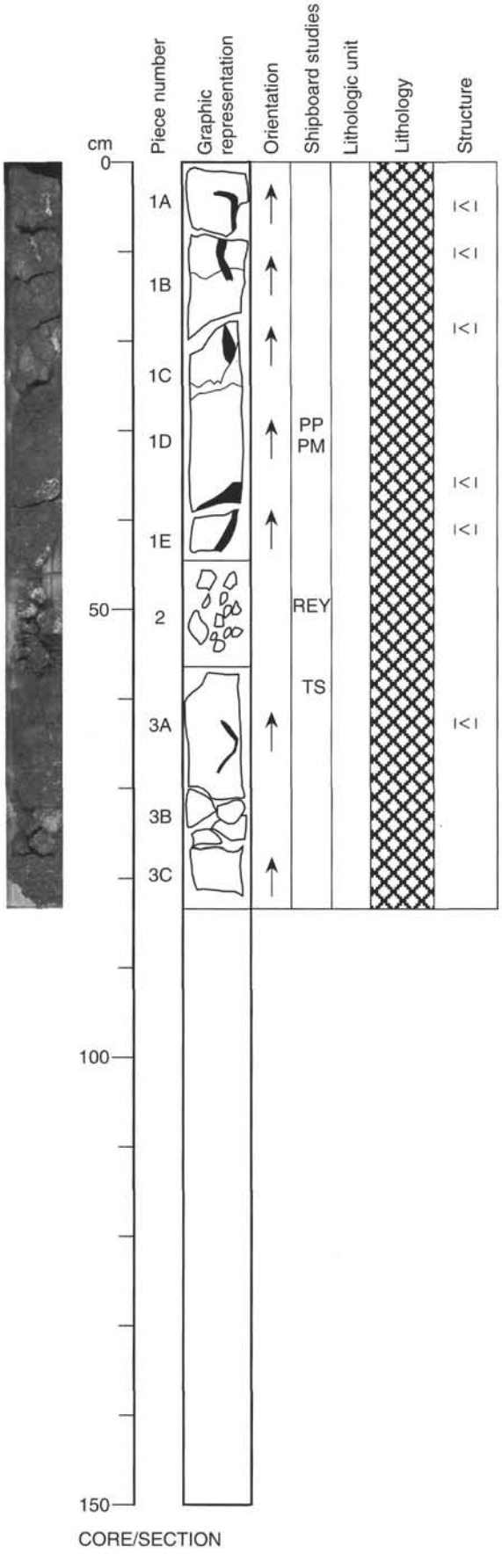
158-957H-5N-1

Piece 1

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 100%, very fine-grained, colloform to fine-grained euhedral, recrystallized.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, fills interstices in bottom 1 cm of sample.
TEXTURAL DESCRIPTION: Massive, recrystallized. Porosity 7%.
ADDITIONAL COMMENTS : Massive pyrite, possibly large (>5 cm) clast in underlying nodular pyrite-silica breccia.

Pieces 2–8

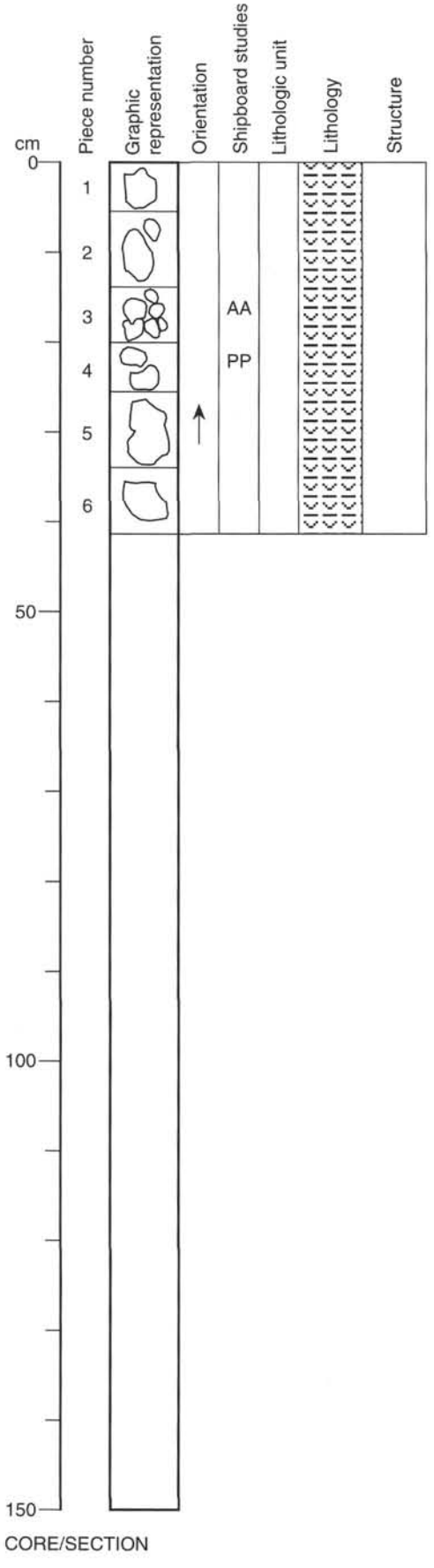
ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 47%, very fine-grained, euhedral grains, and 1- to 20-mm rounded clasts.
Silica, 48%, very fine-grained, matrix, in clasts with pyrite and Fe-oxide.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine- to medium-grained, euhedral, veins in Pieces 5B, 7, and 8, interstitial in vugs.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red Fe-oxide, disseminated in chert clasts.
Chalcopyrite, fine-grained, in pores of some pyrite clasts, as 2- to 3-mm clasts, 1-mm selvages on anhydrite veins in Piece 5B and 8.
TEXTURAL DESCRIPTION: Breccia, nodular. Porosity 10%.
VEINS:
Minerals: Anhydrite veins.
ADDITIONAL COMMENTS: Common 2-mm to 2-cm buff silicified basalt clasts. Abundant rounded siliceous clasts (up to 5 cm) consisting of gray to white quartz plus variable amount of pyrite. Piece 5B: siliceous clast containing disseminated Fe-oxides, pyrite, and angular fragments of altered basalt glass.



158-957H-5N-2

Pieces 1A–3C

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 50%, very fine-grained, replacing basalt and with pyrite in cement.
Pyrite, 35%, very fine- to fine-grained, euhedral, and 1- to 20-mm rounded clasts.
Clay minerals, 10%, very fine-grained, replacing basalt fragments.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 5%, fine- to medium-grained, euhedral, veins with pyrite and chalcopyrite, and filling pores.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red Fe-oxide, disseminated in silica clasts.
Chalcopyrite, fine-grained, enriched in the anhydrite veins.
TEXTURAL DESCRIPTION: Clast-supported breccia. Porosity 10%.
VEINS:
Size: 5-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS : Basalt clasts represent 70% of the whole section. Pyrite occurs as (1) disseminated in the basalt clasts, (2) clasts of massive sulfide, and (3) millimeter-thick rim around the basalt clasts. There is one large silica clast in Piece 3B. Pieces 1B, 1C, and 3A have numerous altered hyaloclastite fragments. Pyrite rims around basalt clasts are not always related to anhydrite and may represent a previous episode of mineralization.

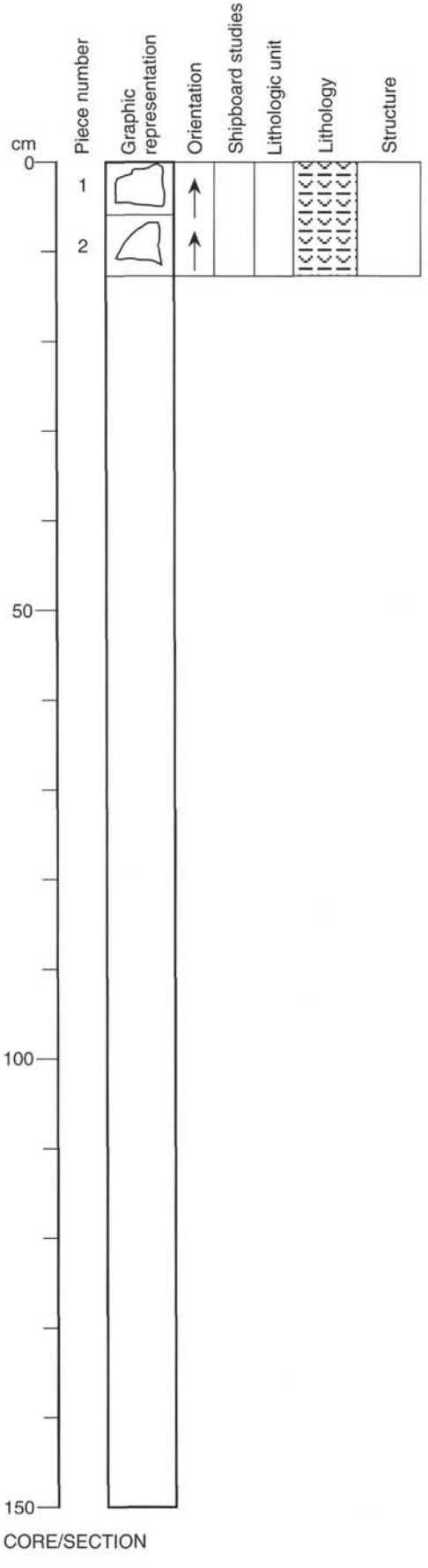


158-957H-6N-1

Pieces 1–6

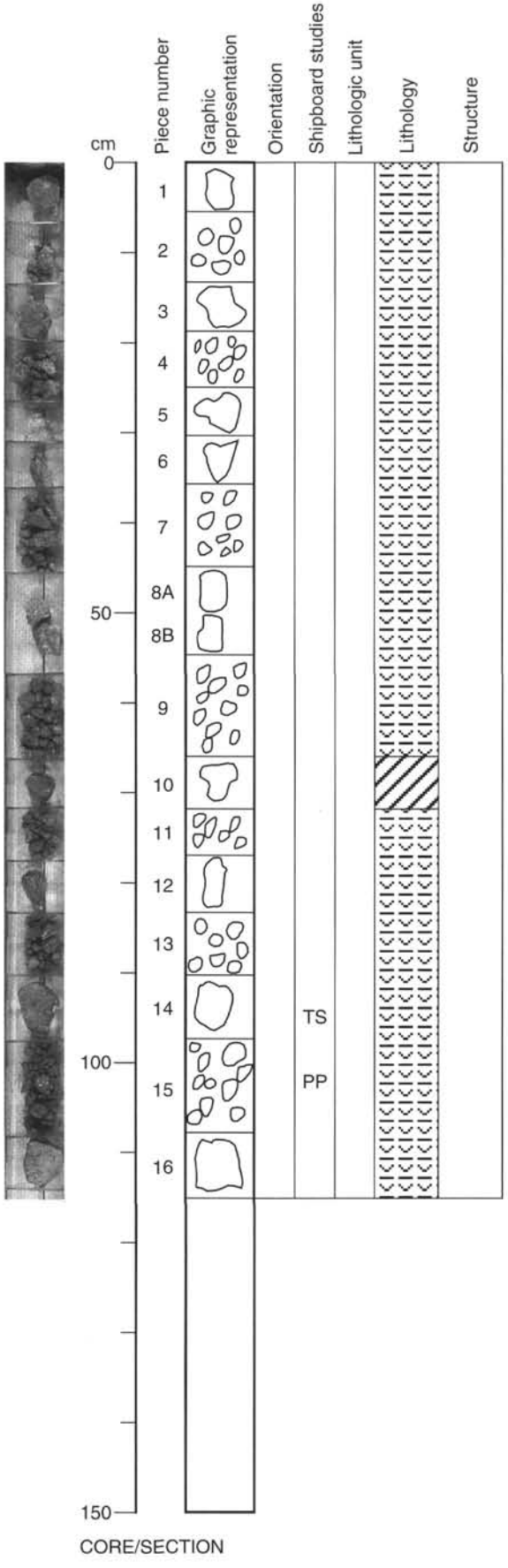
ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 47%, very fine-grained, 1-mm to 1-cm clasts.
Quartz, 47%, very fine-grained, as cement in the matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, fine- to medium-grained, euhedral, late mineral in veins and pores.
Chalcopyrite, 3%, fine-grained, as clasts and enriched in the anhydrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red Fe-oxide, 2-mm clast in Piece 2.
Clay (pale brown), very fine-grained, in altered silicified basalt pieces.
TEXTURAL DESCRIPTION: Matrix-supported breccia. Porosity 10%.
VEINS:
Size: 5-mm veins.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Anhydrite enrichment on broken surfaces may be veins. Pieces 1 and 2 contain small (<2 cm) angular clasts of silicified altered basalt (pale brown clay with disseminated pyrite).

158-957H-7N-1



Pieces 1–2

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, very fine- to fine-grained, euhedral, 0.1-mm grains to 1-cm rounded clasts.
Quartz, 40%, very fine-grained, as cement in the matrix and lining vugs.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, euhedral, on broken surfaces.
Chalcopyrite, fine-grained, as clasts disseminated in cement.
TEXTURAL DESCRIPTION: Matrix supported breccia. Porosity 15%.
ADDITIONAL COMMENTS: Finer grained pyrite-silica breccia than in Section 158-957H-6N-1. Piece 1, silicified basalt clast (1 cm) on outer surface.



158-957H-8N-1

Pieces 1–4, 6, 7, and 9

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: White and yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%–70%, fine- to coarse-grained, disseminated in matrix, nodules.
Quartz, 30%–50%, very fine- to fine-grained, matrix, botryoidal lining vugs.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, 3%, fine- to coarse-grained, in vugs and along minor veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, very fine-grained, associated with pyrite.
Hematite, very fine-grained, euhedral, overgrowing quartz.
TEXTURAL DESCRIPTION: Pyrite clasts in a pyrite-silica breccia.
ADDITIONAL COMMENTS: Pyrite clasts up to 2.5 cm. Quartz is gray to white.

Pieces 5, 8A, and 8B

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: White to gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 70%–75%, very fine- to medium-grained, matrix.
Pyrite, 25%–30%, fine- to medium-grained, disseminated and in veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chlorite, trace to 5%, very fine-grained, in altered basalt fragments.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, medium- to coarse-grained, in late veins and filling vugs.
TEXTURAL DESCRIPTION: White and light gray quartz with disseminated pyrite surrounding altered basalt fragments.
ADDITIONAL COMMENTS: Piece 5, pyrite selvage(?). Piece 8, basalt fragment cut by quartz-pyrite vein (2 mm) and rimmed by white quartz (0.5 cm).

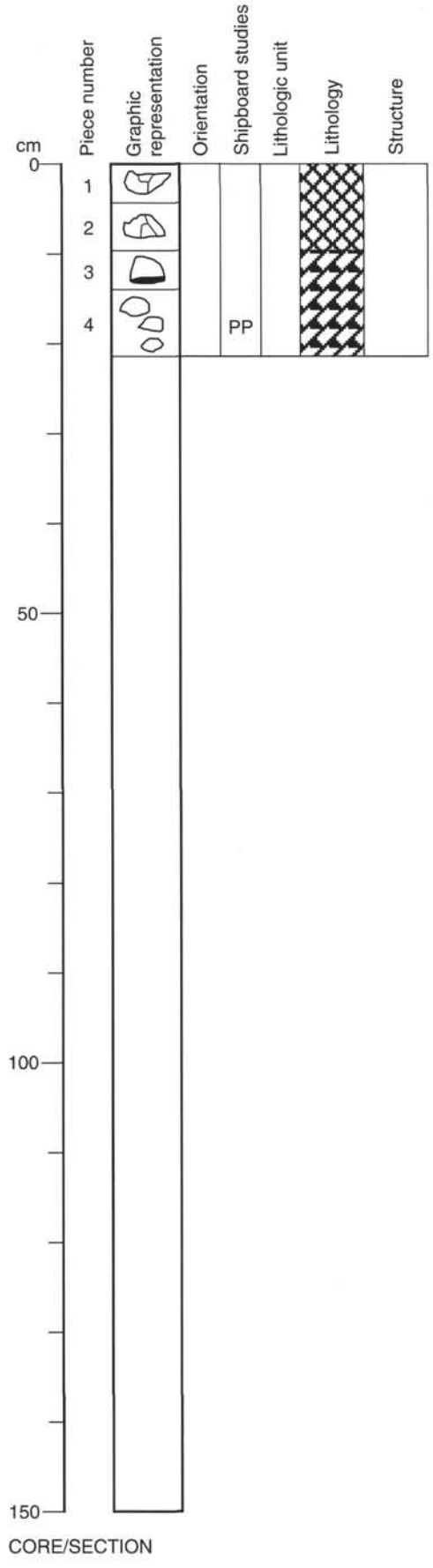
Piece 10

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy green yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine- to medium-grained, euhedral to anhedral, massive clast.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 5%, very fine- to fine-grained, euhedral to anhedral, in vugs.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Hematite, fine-grained, lining quartz in vugs, euhedral.
Chalcopyrite, fine-grained, rimming whole piece, related to anhydrite vein(?).
Anhydrite, fine- to medium-grained, filling vugs and vein.
Chlorite, very fine-grained, associated with chalcopyrite and anhydrite.
TEXTURAL DESCRIPTION: Massive pyrite clast from pyrite-silica breccia.

Pieces 11–16

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Dark green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 45%–60%, fine- to coarse-grained, disseminated in matrix and as clasts (up to 1 cm).
Quartz, 35%–40%, fine-grained, matrix and botryoidal in vugs.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chlorite, 5%–15%, very fine-grained, in matrix and as discrete clast.
Chalcopyrite, 2%–5%, fine-grained, discrete clasts, sometimes with pyrite, some associated with anhydrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Hematite, euhedral, lining vugs, overgrowing quartz.
Anhydrite, in vugs and as veins with chalcopyrite.
TEXTURAL DESCRIPTION: Pyrite clasts in silica-chlorite matrix.
ADDITIONAL COMMENTS: Hematite is more abundant than in Pieces 1–10. Chert clast in Piece 16 and chlorite clast in Piece 14. Remnants of chloritized basalt fragment cut by pyrite veinlets in Piece 10.

158-957H-9X-1

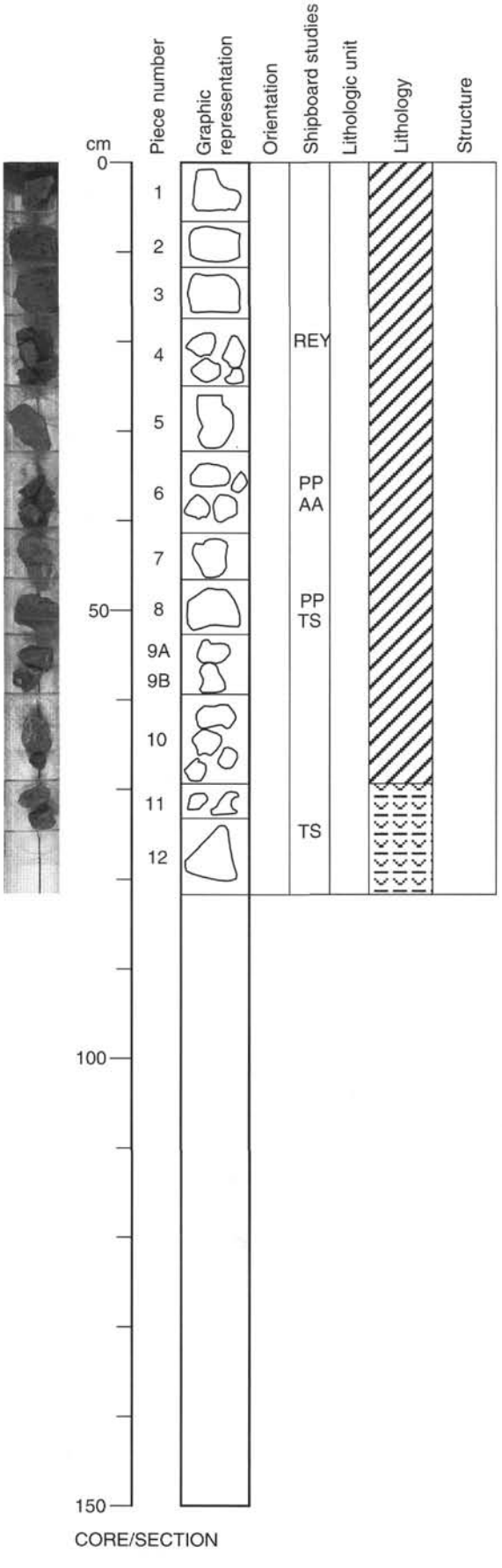


Pieces 1 and 2

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz 70%, very fine-grained, white to gray breccia matrix, lining vugs, replacing basalt clasts.
Pyrite 20%, fine-grained, euhedral, disseminated in quartz matrix and altered basalt clasts, lining vugs. 0.1- to 1-cm clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, on broken surfaces (veins?).
Anhydrite, on broken surfaces (veins?).
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity <5%.
ADDITIONAL COMMENTS: 0.5 to 2-cm chloritized and silicified basalt clasts in a matrix of white to gray quartz plus pyrite. Anhydrite and chalcopyrite on broken surfaces may be remnants of veins.

Pieces 3 and 4

ROCK TYPE: MASSIVE PYRITE BRECCIA (Type 6b).
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite 70%, fine- to coarse-grained, euhedral, 0.1- to 1-cm clasts, granular aggregates in vein with chalcopyrite.
Quartz 16%, very fine- to fine-grained, breccia matrix, lining vugs.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 7%, on broken surfaces (veins?).
Anhydrite, 7%, on broken surfaces (veins?).
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 5%.
VEINS:
Size: 3-mm veins.
Minerals: Pyrite, chalcopyrite, and quartz.
ADDITIONAL COMMENTS: Vein selvage(?) sulfide breccia with white quartz cement. Piece 3 has remnants of pyrite plus chalcopyrite vein, and all pieces have anhydrite on broken surfaces, possibly remnants of anhydrite veins.



158-957I-1N-1

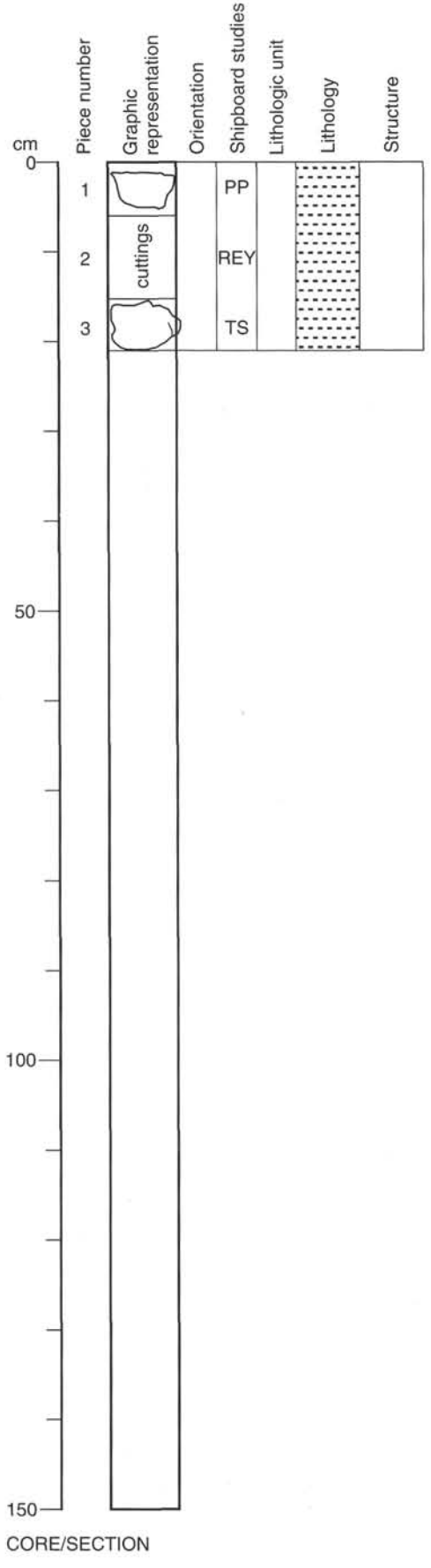
Pieces 1–10

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Brassy yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 100%, fine- to medium-grained, in places colloform and/or botryoidal(?), vugs are lined by euhedral pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Goethite, very fine-grained, as rust coating on pyrite, sometimes needles.
Chalcopyrite, fine-grained, disseminated aggregates in pyrite.
ADDITIONAL COMMENTS: Piece 1, massive pyrite channelways in more porous pyrite. Piece 7, "clast" of recrystallized pyrite (lighter color).

Pieces 11 and 12

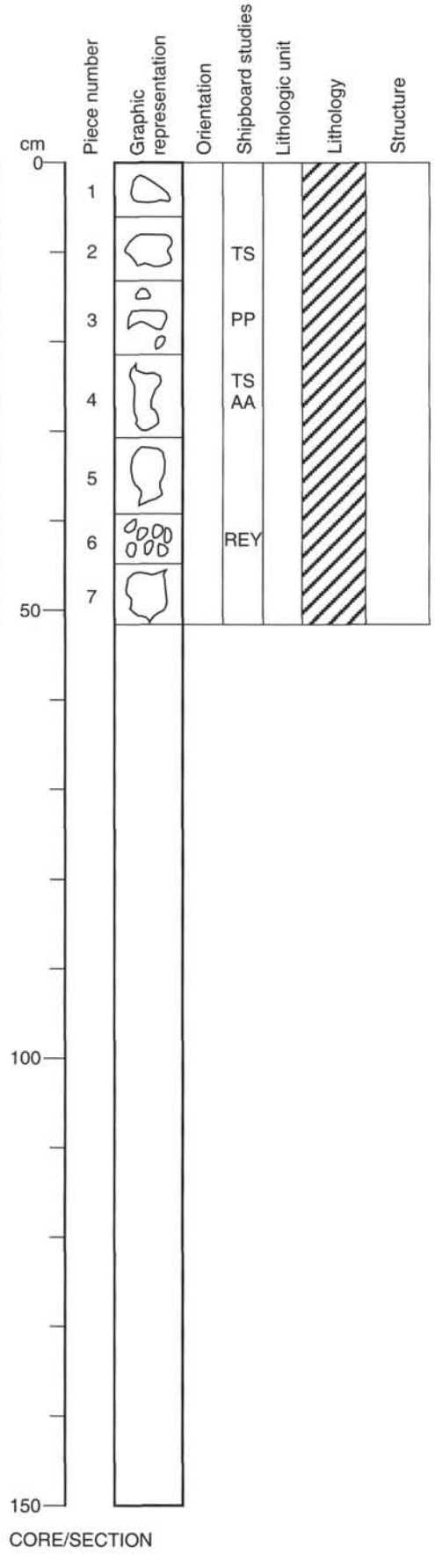
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, fine- to medium-grained, millimeter-sized aggregates in quartz matrix, as vein filling and as clasts.
Quartz, 50%, fine-grained, dark gray and light gray matrix.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Red chert, very fine-grained, dark red clast in pyrite vein and patches in pyrite-silica breccia.
Chalcopyrite, fine-grained, enriched in small areas of pyritic vein. Some disseminated in matrix.
TEXTURAL DESCRIPTION: Light gray pyrite-silica clasts with red chert material in a matrix of dark gray quartz and disseminated pyrite. The clasts are rimmed by a layer of pyrite, possibly a vein. Porosity 7%.
ADDITIONAL COMMENTS: Pyrite "vein" shows single 1-mm-sized dark red Fe-oxide clast. Massive pyrite clasts are <1 cm; light gray silica clasts with disseminated pyrite and trace of Fe-oxide are larger.

158-957J-1X-1



Pieces 1–3

ROCK TYPE: RED AND GRAY CHERT (Type 2 and 3)
CONTACTS: None.
COLOR: Red and gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Red chert, 70%, very fine-grained, massive chert with irregular boundaries.
Gray chert, 20%, very fine-grained, massive chert with irregular boundaries.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 10%, fine-grained, disseminated in cherty material and as rim on gray chert.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Limonite, very fine-grained, thin coating on pyrite.
TEXTURAL DESCRIPTION: Massive red chert with irregular boundaries to surrounding gray chert. Gray chert is rimmed by pyrite (partially oxidized).
ADDITIONAL COMMENTS: Porosity is concentrated in gray chert. Small veinlet (1 mm) in red chert is filled partially with pyrite. This vein almost disappears in the gray chert. Few pyrite cobbles in Piece 2 (drill cuttings) together with limonite.

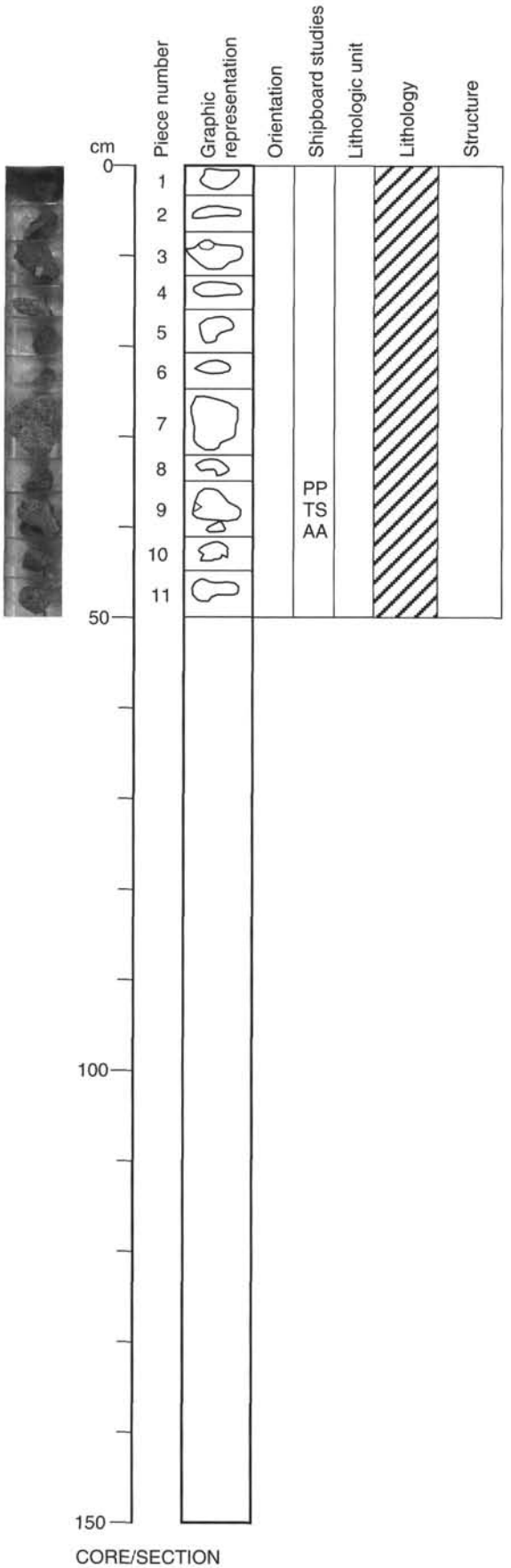


158-957K-1X-1

Pieces 1–7

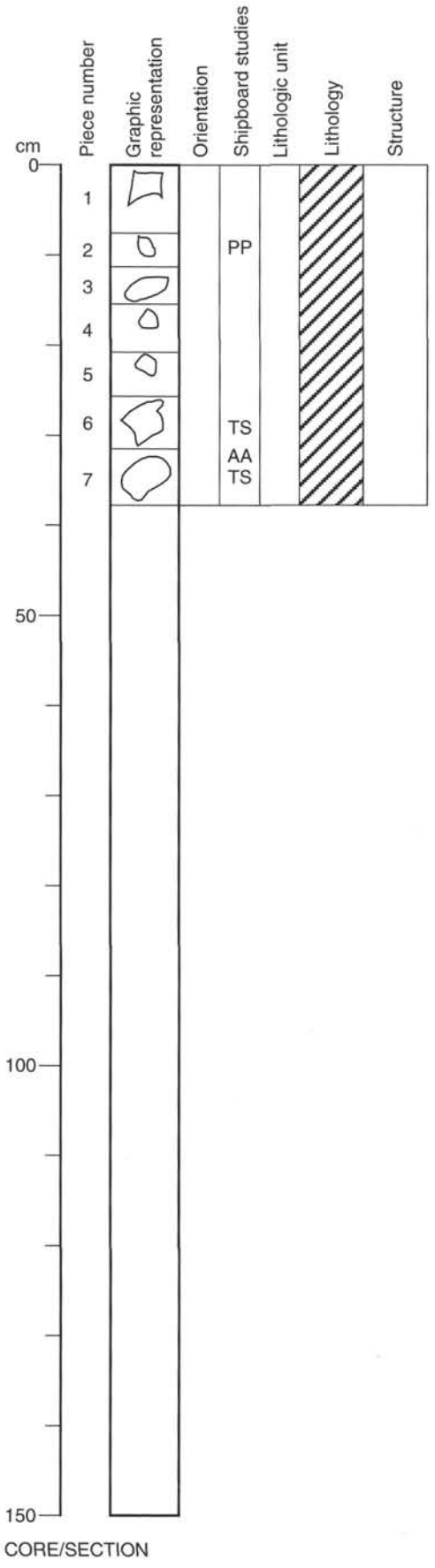
ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, fine-grained, euhedral to collomorph.
Silica, 10%, very fine-grained, dark gray to black chert breccia fragments.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, disseminated in pyrite, interstitial.
Red Fe-oxide, very fine-grained, at surface of pieces and as vein(?) in Piece 2.
TEXTURAL DESCRIPTION: Massive, breccia. Porosity 15%–20%.
ADDITIONAL COMMENTS: Piece 2 has 65% of centimeter-sized angular clasts of black chert. Smaller black to gray chert clasts are in Pieces 2, 3, 4, and 7.

158-957K-2N-1



Pieces 1–11

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 100%, fine- to very fine-grained, euhedral to colloform.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, disseminated grains in pyrite, interstitial.
Fe-oxide, very fine-grained, on exposed surfaces, orange brown on Pieces 1, 2, 5, 6, and 10.
Silica, filling pore spaces in Piece 6.
Sphalerite, rare in vugs.
Covellite, in vugs on chalcopyrite.
Unidentified white mineral intergrown with sphalerite.
TEXTURAL DESCRIPTION: Laminated, nodular. Porosity 15%.
ADDITIONAL COMMENTS: Fine pyrite laminations (colloform pyrite) lining outer part in Pieces 1, 2, 7, 8, and 9. Pieces 3, 4, and 7 contain nodular bits of pyrite. Pores have vermicular textures especially in Pieces 9–11.

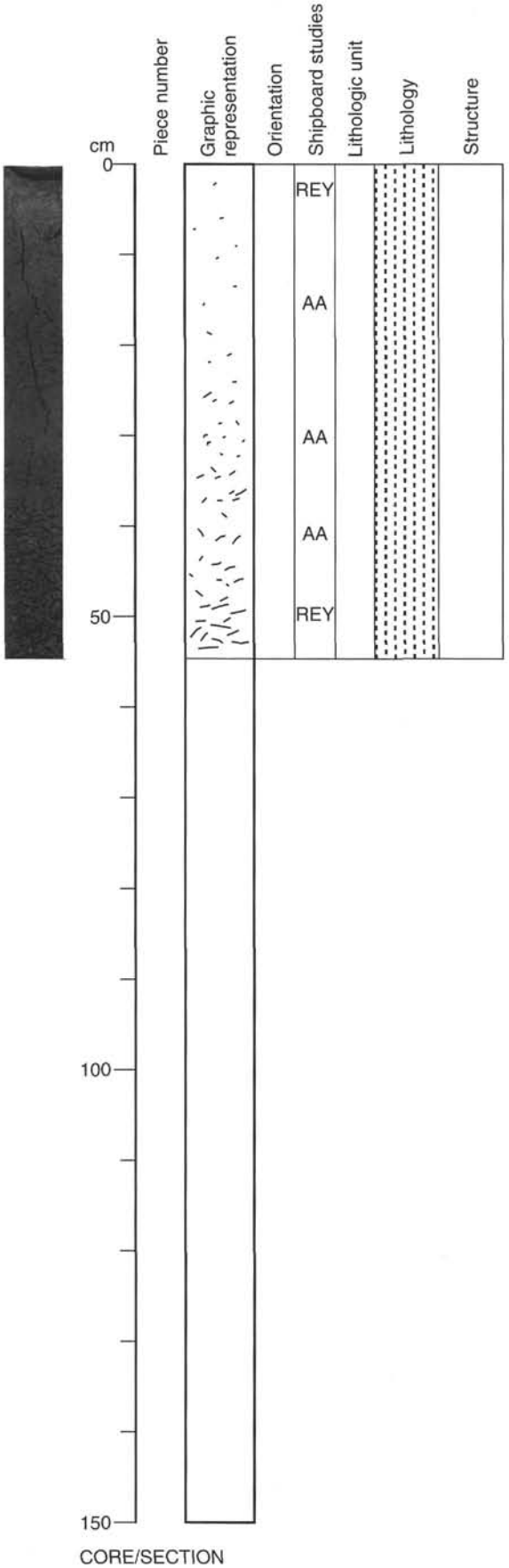


158-957K-3X-1

Pieces 1–7

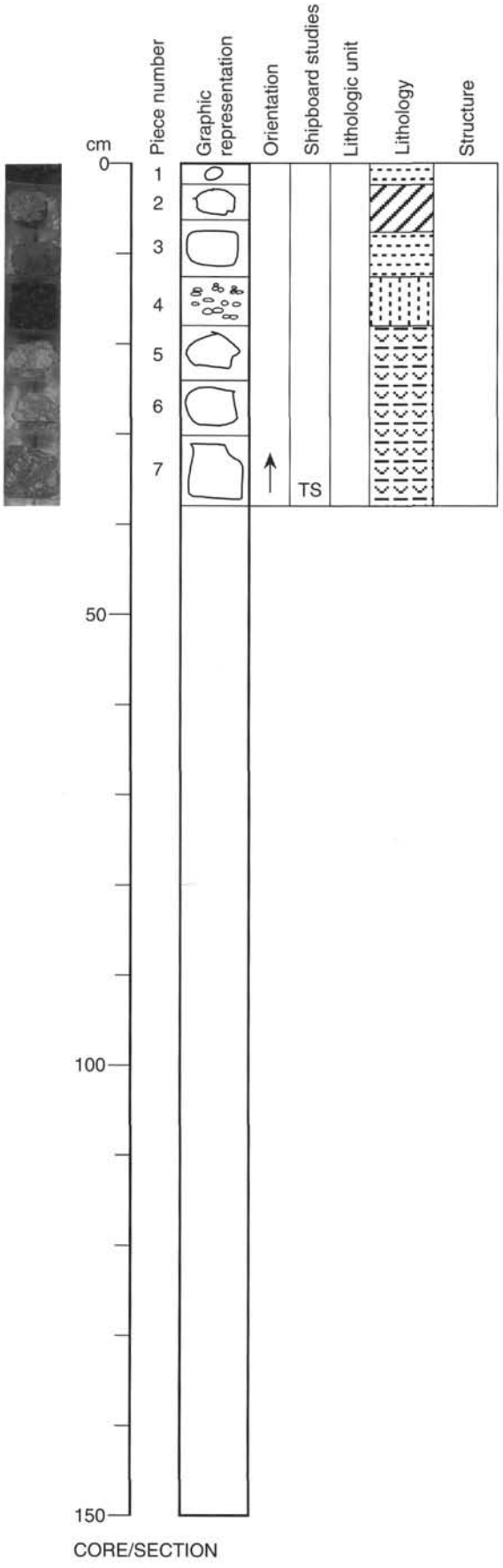
ROCK TYPE: MASSIVE PYRITE (Type 5)
CONTACTS: None.
COLOR: Brassy gray green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine- to medium-grained, massive and vein related.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 10%, very fine- to fine-grained, in matrix and veins crosscutting massive pyrite, colloform.
Sphalerite, 5%, euhedral, granular, dark brown, disseminated and in veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite, fine-grained, vein associated with pyrite and quartz, in veins crosscutting massive pyrite.
Limonite, very fine-grained, oxidation product of pyrite.
TEXTURAL DESCRIPTION: Massive pyrite overgrown by colloform pyrite, in places veined. Pieces are slightly silicified and some veins consist of sphalerite-pyrite-quartz.
ADDITIONAL COMMENTS: Colloform pyrite overgrowing porous pyrite especially in Pieces 4 and 7. Veining is clearly visible in Piece 6. All samples are slightly oxidized to limonite.

158-957M-1R-1



Piece 1

ROCK TYPE: Fe-OXIDE/OXYHYDROXIDE (Type 1)
CONTACTS: None.
COLOR: Red brown.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Fe-oxide/oxyhydroxide, 100%, mud to pebble sized drill cuttings.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Pyrite, 1 mm, grains and aggregates.
Silica(?), 1 mm, dark gray grains.
TEXTURAL DESCRIPTION: Size-graded drill cuttings.
ADDITIONAL COMMENTS: Size-graded Fe-oxide/oxyhydroxide drill cuttings. Larger centimeter-sized clasts are mainly platy, some are layered. Colors range from red to orange to brown.



158-957M-1R-2

Pieces 1 and 3

ROCK TYPE: RED CHERT (Type 2)
CONTACTS: None.
COLOR: Red.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 58%, very fine-grained, replacing basalt clasts, dark gray in breccia matrix.
Fe-oxide, 30%, very fine-grained, disseminated in silica.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, very fine-grained, colloform. Some disseminated millimeter-sized pyrite in the red chert.
TEXTURAL DESCRIPTION: Massive. Porosity 10%.
ADDITIONAL COMMENTS: Pyrite forms a millimeter-wide band at the surface of the sample and fills some vugs.

Piece 2

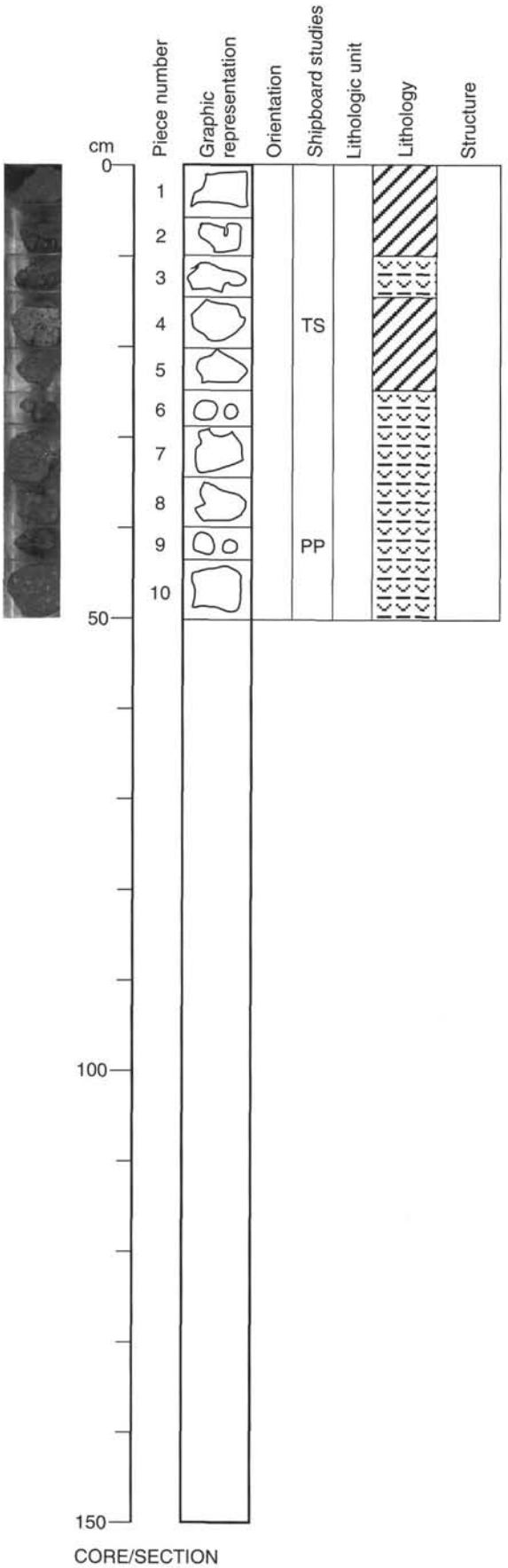
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 100%, very fine- to fine-grained.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, disseminated in pyrite.
Fe-oxide, some oxidation at the surface of pyrite and chalcopyrite crystals in vugs.
TEXTURAL DESCRIPTION: Massive, clastic. Porosity 5%.
ADDITIONAL COMMENTS: Some clastic texture in pyrite on one side of the sample, 5-mm clasts cemented by pyrite.

Piece 4

ROCK TYPE: Fe-OXIDE/OXYHYDROXIDE (Type 1)
CONTACTS: None.
COLOR: Red brown.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Fe-oxide/oxyhydroxide, 100%, 1 mm to 1 cm, angular drill cuttings
ADDITIONAL COMMENTS: Drill cuttings. Larger pieces are platy, some are layered. Color ranges from orange to red to brown.

Pieces 5–7

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 68%, very fine-grained, replacing basalt clasts, dark gray in breccia matrix.
Pyrite, 20%, very fine- to coarse-grained, disseminated in basalt clasts and matrix, 0.1- to 5-mm aggregates in matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Clay, 5%, very fine-grained, in silicified basalt clasts.
Chalcopyrite, 7%, fine-grained, along margins of basalt clasts and disseminated within matrix near clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxyhydroxide, disseminated in silicified basalt clasts.
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 5%.
ADDITIONAL COMMENTS: 1- to 2-cm silicified basalt clasts in a dark gray matrix of silica and pyrite. 0.5-mm pyrite rim around most basalt clasts.



158-957M-2R-1

Pieces 1–2 and 4–5

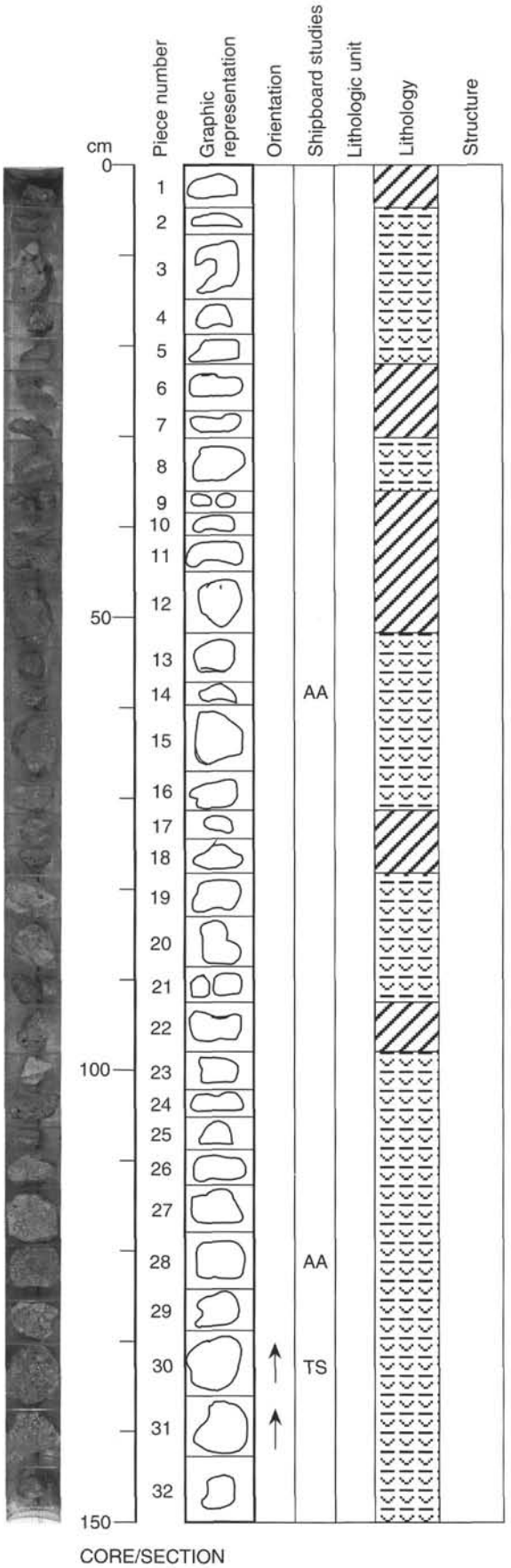
ROCK TYPE: MASSIVE POROUS PYRITE (Type 5a)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%–98%, fine- to medium-grained, euhedral aggregates and colloform.
Marcasite, 50%, fine- to medium-grained, euhedral aggregates and colloform.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 4%, fine- to medium-grained, aggregates.
Sphalerite, 3%, fine-grained, colloform, lining cavities (conduits).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, very fine-grained, disseminated in silica.
Silica, very fine-grained, rare clast and vein in Piece 4.
TEXTURAL DESCRIPTION: Piece 1: Massive, granular pyrite breccia in a porous, granular pyrite matrix. Clasts up to 1 cm, subangular to subrounded. Pieces 2, 4, and 5: Massive colloform porous pyrite and marcasite cementing rare chert clasts with minor sphalerite lining a complex network of interconnecting channelways.
ADDITIONAL COMMENTS: Pieces 4 and 5: One chert clast of white quartz with disseminated pyrite and a trace of remnant hematite. Clasts have thin (≤1 mm) rims of pyrite.

Pieces 3 and 6–9

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Brassy gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 25%–30%, fine- to medium-grained, granular aggregates, nodules (clasts) of disseminated grains.
Marcasite, 10%–30%, fine- to medium-grained, granular aggregates, nodules (clasts) of disseminated grains.
Silica, 60%–70%, fine-grained, massive matrix and cherty clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, trace–5%, fine-grained, disseminated, granular aggregates.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, fine-grained, disseminations in light gray chert clasts.
Clay, very fine-grained, altered basalt clasts.
Sphalerite, fine-grained, lining vugs.
TEXTURAL DESCRIPTION: Quartz-cemented chert breccia with angular clast of gray chert up to 2 cm in diameter. Three basalt fragments are <1 cm in diameter. Abundant disseminated sandy pyrite aggregates in the dark gray quartz matrix.
ADDITIONAL COMMENTS: Chert clasts are dominantly white quartz with disseminated pyrite ± chalcopyrite with remnant hematite. Chert clasts and vugs are lined by colloform pyrite and marcasite. Dominantly matrix supported. Even distribution of disseminated pyrite suggesting it may be a late overprint.

Piece 10

ROCK TYPE: PYRITE SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine- to medium-grained, granular aggregates, clast up to ~0.5 cm.
Silica, 25%, fine-grained, matrix, light gray clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, granular aggregates, possible clasts up to ~3 mm.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, fine-grained, in light gray siliceous clasts.
Clay, fine-grained, in altered basalt clasts.
TEXTURAL DESCRIPTION: Dominantly clastic pyrite, subangular to subrounded, locally nodular fragments in a dark gray quartz matrix with abundant sandy pyrite.
ADDITIONAL COMMENTS: There are possibly three altered basalt clasts up to 1 cm in diameter present and common chalcopyrite clasts in the sandy pyrite matrix.



158-957M-3R-1

Pieces 1, 6, 7, 9-12, 17, 18, 22

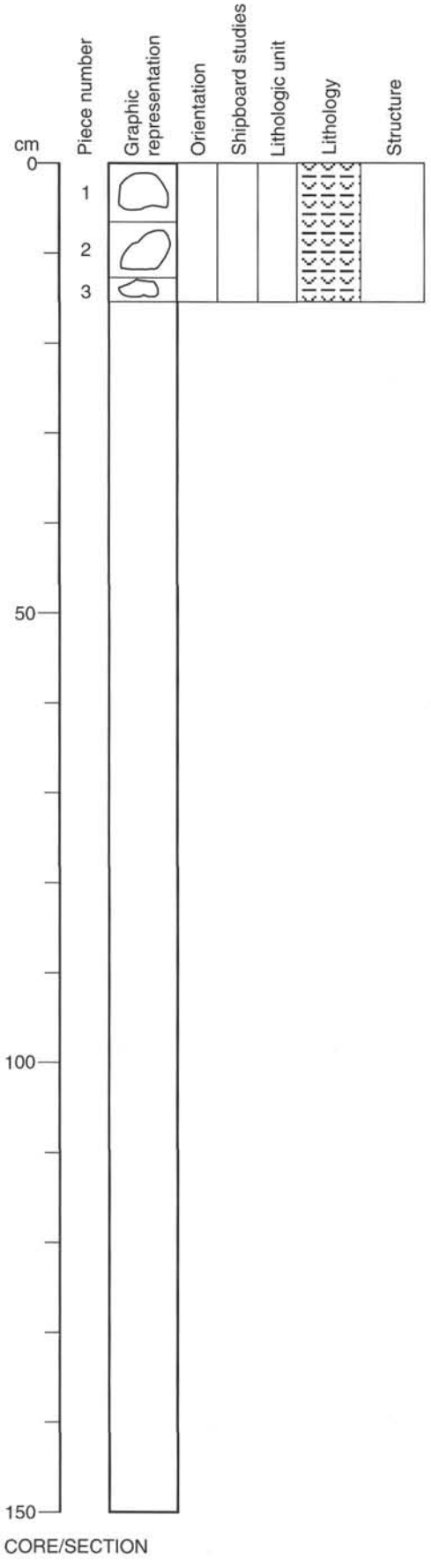
ROCK TYPE: MASSIVE COLLOFORM PYRITE (Type 5a)
CONTACTS: None.
COLOR: Brassy, gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine-grained, massive, colloform, porous (10% vuggy).
Marcasite, 40%, fine-grained, massive, colloform, all fine- to medium-grained up to 1-mm euhedra, lining cavities locally.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, <5%, fine-grained, dominantly as chert clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite, fine-grained, lining late cavities in colloform pyrite.
Fe-oxide, coating on Piece 6.
Chalcopyrite, fine-grained, intergrown with pyrite.
TEXTURAL DESCRIPTION: Massive, colloform, porous, vuggy.
ADDITIONAL COMMENTS: Massive colloform pyrite-marcasite contains few angular chert clasts, variably mineralized. Cut by veins of pyrite-marcasite locally (fluid channelways locally lined by sphalerite). Sphalerite also occurs locally along colloform pyrite-marcasite bands.

Pieces 2–5, 8,13–16,19–21

ROCK TYPE: PYRITE-SILICA BRECCIA (TYPE 9a)
CONTACTS: None.
COLOR: Brassy gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite-marcasite, 50%–60%, fine- to medium-grained, granular aggregates in dark gray siliceous matrix, locally as clasts.
Silica, 40%, fine-grained, matrix of granular pyrite, dark gray due to ultrafine sulfide inclusions.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine- to medium-grained, granular aggregates in dark gray siliceous matrix, locally as clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Hematite, fine-grained, remnant hematite in siliceous matrix, possibly replaced red chert clasts.
TEXTURAL DESCRIPTION: Fine- to medium-grained breccia with nodular to subangular pyrite "clasts" or aggregates in dark gray siliceous matrix. Similar to nodular pyrite-silica breccia.
ADDITIONAL COMMENTS: Dominantly matrix-supported, quartz-rich matrix with fine-grained, disseminated pyrite-chalcopyrite sand. Large clasts up to 1–2 cm locally of angular pyrite and quartz-replaced cherty fragments. No obvious recognizable basalt fragments.

Pieces 23–32

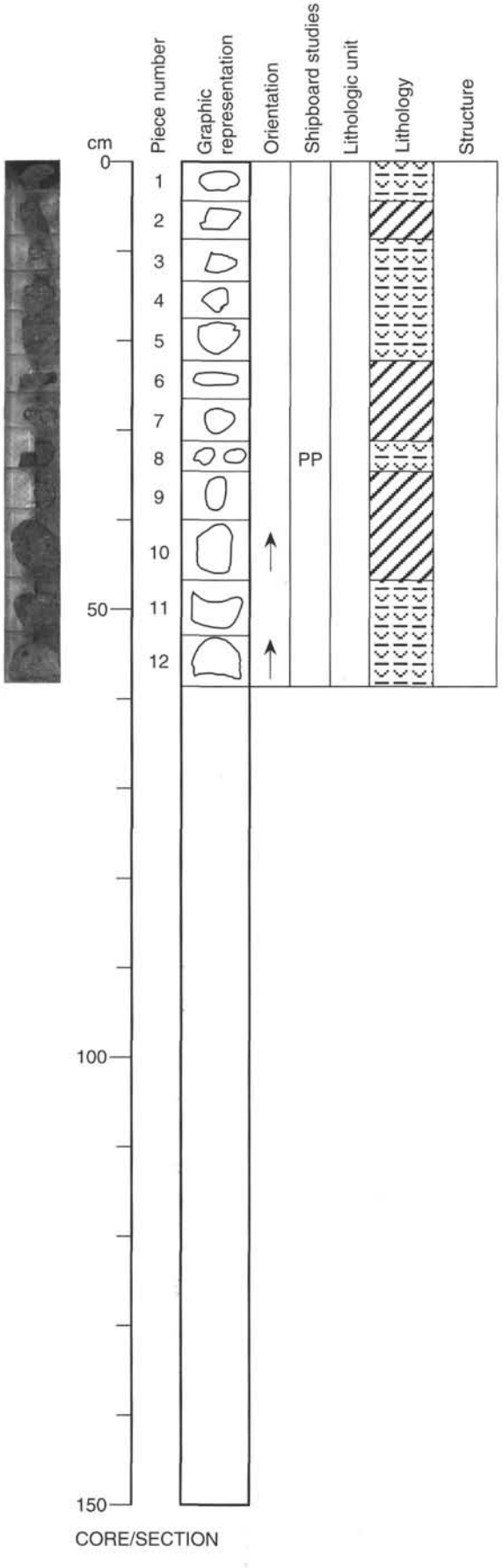
ROCK TYPE: PYRITE-SILICA BRECCIA WITH WALLROCK CLASTS (Type 9a)
CONTACTS: None.
COLOR: Brassy gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, fine- to medium-grained, granular aggregates, and larger clasts.
Silica, 50%, dominantly as fine-grained dark gray siliceous matrix.
Marcasite, ~10%, fine-grained, coatings on clasts and as 1- to 2-mm linings along fluid channelways.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, <5%, fine- to medium-grained, disseminated granular aggregates possibly along fractures and conduits through breccia.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite.
Clays, in altered basalt clasts.
ADDITIONAL COMMENTS: Samples consist of >50% pyrite-silica breccia with larger clasts of silicified wallrock fragments, but wallrock fragments do not dominate rock. Wallrock fragments are variably altered suggesting transport following alteration (i.e., no in situ brecciation). Wallrock clasts are locally composed of hyaloclastite fragments in Pieces 27, 28, 31, and 32.



158-957M-3R-2

Pieces 1–3

ROCK TYPE: PYRITE-SILICA BRECCIA WITH WALLROCK CLASTS (Type 9a)
CONTACTS: None.
COLOR: Brassy gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, fine- to medium-grained, granular aggregates, and larger clasts.
Silica, 50%, dominantly as fine-grained dark gray siliceous matrix.
Marcasite, ~10%, fine-grained, coatings on clasts and as 1- to 2-mm linings along fluid channelways.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, <5%, fine- to medium-grained, disseminated granular aggregates possibly along fractures and conduits through breccia.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite.
Clays, in altered basalt clasts.
ADDITIONAL COMMENTS:
Samples consist of >50% pyrite-silica breccia with larger clasts of silicified wallrock fragments, but wallrock fragments do not dominate rock. Wallrock fragments are variably altered, suggesting transport following alteration (i.e., no in situ brecciation).



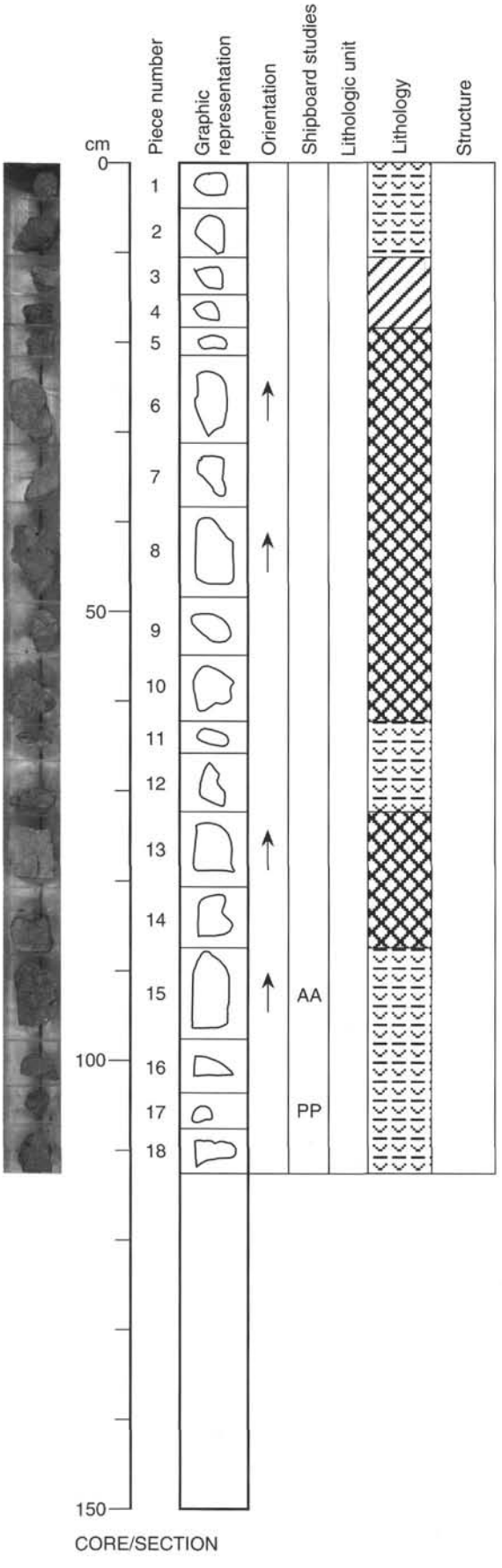
158-957M-4R-1

Pieces 1, 3–5, 8, and 11–12

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Brassy, gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 35%–80%, fine-grained, in matrix and clasts.
Pyrite, 30%–60%, fine- to coarse-grained, euhedral, disseminated in matrix, clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Marcasite, 0%–10%, fine-grained, associated with pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, disseminated in pyrite clasts and as clasts.
Fe-oxide, fine-grained, disseminated in cores of light gray silica clasts and as separate clasts.
Sphalerite, fine-grained, euhedral to botryoidal, lining vugs.
TEXTURAL DESCRIPTION: Breccia, matrix supported, angular to subrounded pyrite, pyrite-silica, and basalt clasts.
ADDITIONAL COMMENTS: Colloform-banded pyrite rims some clasts and occurs in veins. Chalcopyrite occurs as disseminated grains in the matrix and rimming some clasts. Piece 5 has 1.5-cm red chert clast. Piece 12 has a buff silicified basalt clast that is partly replaced by matrix quartz and pyrite and veined by pyrite.

Pieces 2, 6–7, and 9–10

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%–90%, fine- to medium-grained, euhedral to anhedral, colloform to massive, numerous concentric growth zones.
Marcasite, 5%–10%, fine-grained, colloform to massive, numerous concentric growth zones.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 2%–5%, fine-grained, in clasts with disseminated pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, disseminations, rimming concentrically zoned pyrite clasts.
TEXTURAL DESCRIPTION:
Massive, porous, colloform banding, network of interconnecting channelways.
ADDITIONAL COMMENTS:
Piece 2 contains one 2-cm dark gray silica clast. Piece 7 has two silica clasts. Piece 10 has several 2-mm to 1-cm dark gray silica clasts, numerous concentric growth bands (<1 mm) thick in pyrite clasts. Silica clast is partially replaced by pyrite.



158-957M-5R-1

Pieces 1–2, 11–12, and 15–18

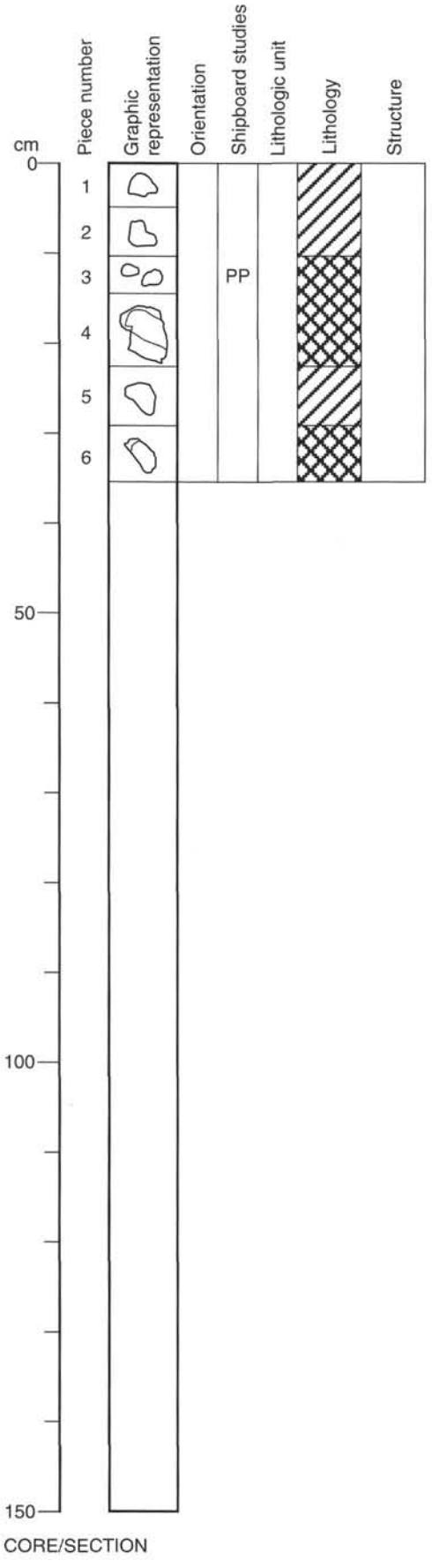
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a) WITH SILICIFIED BASALT CLASTS
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 58%, very fine- to fine-grained, 0.1- to 6-mm clasts, disseminated in matrix. Coating some siliceous clasts.
Silica, 37%, very fine- to fine-grained, black to dark gray, matrix and coating pyrite in vugs.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 4%, fine-grained, disseminated in matrix and surrounding some clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Clays, 5%, very fine-grained, replacing basalt at the core of the clasts.
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 17%.
VEINS:
Size: 0.1- to 2-mm veins.
Minerals: Quartz, pyrite.
ADDITIONAL COMMENTS: Silicified basalt clasts in Pieces 1, 2, 11, 12, 15, 16, and 18. Gradational to surrounding silicified wallrock breccia.

Pieces 3–4

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 100%, fine- to medium-grained, euhedral, massive.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Clay, white clay in interstices of massive pyrite.
Gypsum(?), prismatic clear mineral, interstitial.
Silica(?), filling some pores.
TEXTURAL DESCRIPTION: Massive.

Pieces 5–10 and 13–14

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 65%, very fine- to fine-grained, some euhedral quartz in open spaces.
Pyrite, 30%, very fine- to fine-grained, disseminated in clasts and in veins, rimming some clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Clay minerals, 5%, very fine-grained, replacing basalt at the core of the clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite, fine-grained, late, coating pyrite crystals in some vugs.
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 13%, related to vuggy veins.
VEINS:
Size: 0.1- to 2-mm veins.
Minerals: Quartz, pyrite.
ADDITIONAL COMMENTS: 0.1- to 1-mm pyrite veins, 0.1- to 2-mm quartz veins with pyrite. Quartz veins cut small early pyrite veins. Some clasts are rimmed by pyrite, which is related to replacement of clast margin plus vein material. Pieces 6, 8, and 9 appear to be silicified fragments of fine-grained to glassy basalt.



158-957M-6R-1

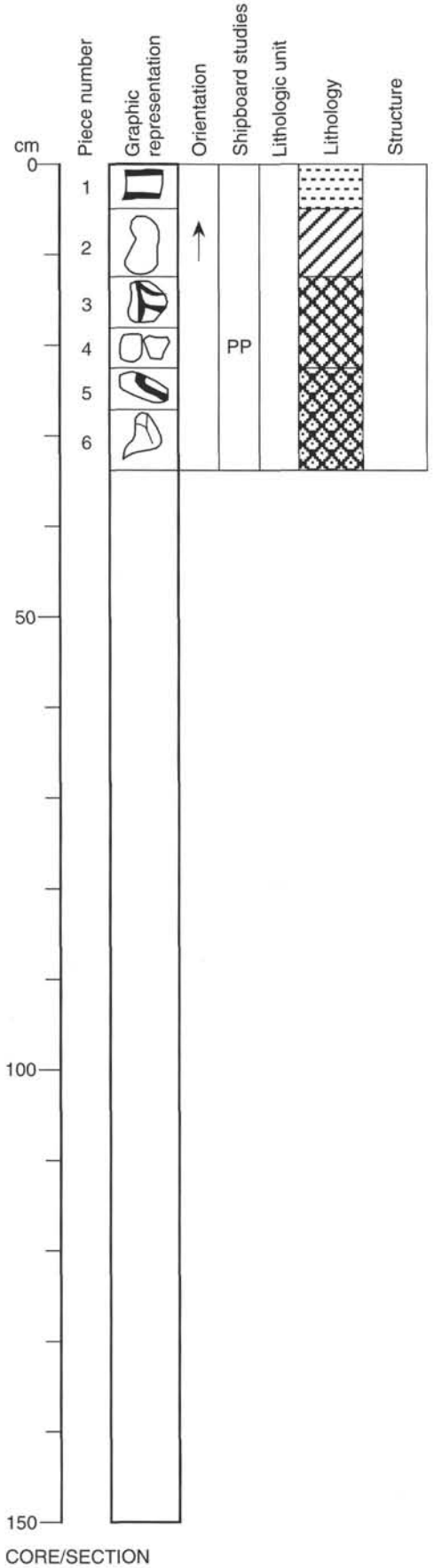
Pieces 1–2 and 5

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine- to medium-grained, euhedral, massive.
Silica, 15%, fine-grained, mainly in clasts with pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Clay minerals, in the silicified clasts.
Chalcopyrite, fine-grained, in the clasts.
TEXTURAL DESCRIPTION: Massive, brecciated. Porosity 10%.
ADDITIONAL COMMENTS: 2-mm to 2-cm clasts of pyrite-silica breccia cemented by massive granular pyrite. In Piece 5, the clast fragments show clear primary basaltic textures.

Pieces 3–4 and 6

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 75%, very fine- to fine-grained, replacing basalt clasts and in cement. Some euhedral quartz in open spaces.
Pyrite, 15%, very fine-grained, disseminated in white to gray silica from the cement, and as small (<1 mm) veins in clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Clay minerals, 10%, very fine-grained, replacing basalt at the core of the clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Sphalerite, fine-grained, late, rare grains disseminated in cement.
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 10%.
VEINS:
Size: <1-mm veins.
Minerals: Pyrite in clasts.
ADDITIONAL COMMENTS: Pyrite enriched in a rim around the clasts, remnant vein in Piece 6. 8- to 20-mm "vein" of white quartz plus pyrite in Piece 4 may be matrix for breccia and may replace basalt.

158-957M-7R-1



Piece 1

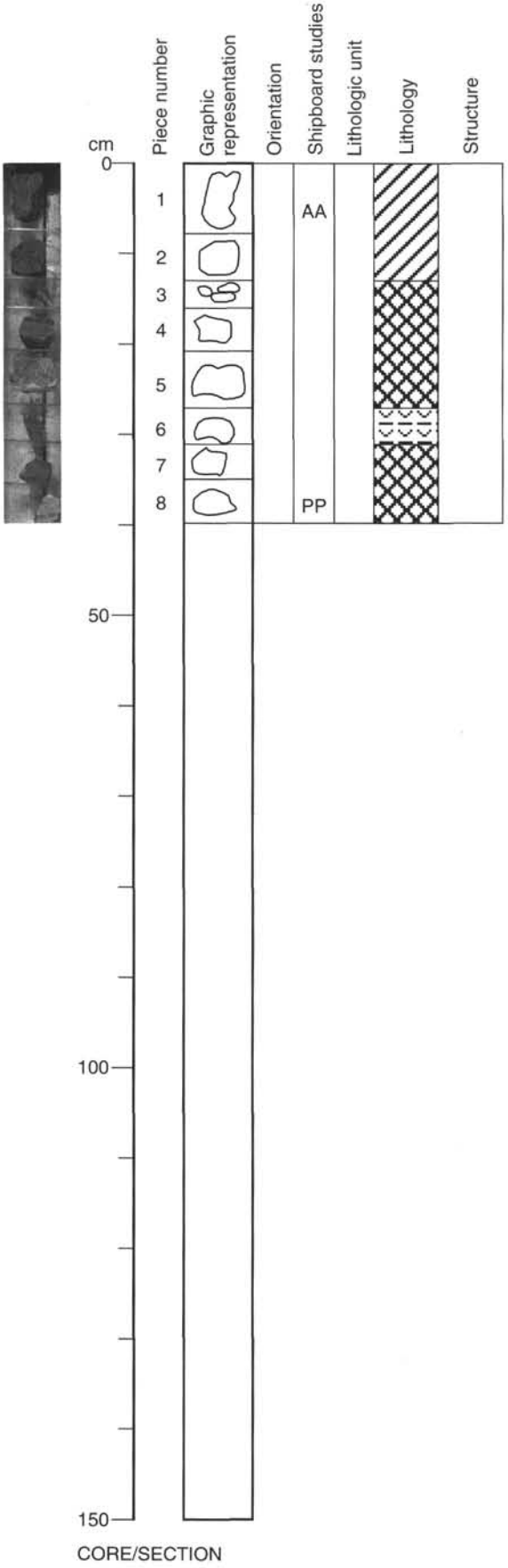
ROCK TYPE: GREY CHERT (Type 3)
CONTACTS: None.
COLOR: Gray and red.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 90%, medium-grained, gray to white, granular, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, fine-grained, disseminated in quartz and rimming clast.
Fe-oxide/oxyhydroxide, 5%, very fine-grained, disseminated in quartz.
TEXTURAL DESCRIPTION: Massive. Porosity 5%.
ADDITIONAL COMMENTS: Angular quartz-rich clast with disseminated pyrite, stained red by Fe-oxide/oxyhydroxide and rimmed by pyrite.

Piece 2

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 94%, very fine-grained, euhedral, massive, replacing and cementing a 1-cm basalt clast.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Quartz, 3%, fine-grained , mainly in clasts with pyrite, replacing 1-cm-sized basalt clast.
Clay minerals, 3%, very fine-grained, replacing 1-cm-sized basalt clast.
TEXTURAL DESCRIPTION: Massive, clastic. Porosity 10%.
ADDITIONAL COMMENTS: Sample composed of 20% pyritized basalt clasts and 80% massive granular pyrite matrix. Pyritized basalt clasts are rounded, 1-cm diameter.

Pieces 3–6

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 60%, very fine-grained, replacing basalt and in veins.
Pyrite, 20%, fine- to medium-grained, related to veining.
Clay minerals, 20%, replacing basalt clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide/oxyhydroxide, in white quartz vein(?) in Piece 3.
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 7%.
VEINS:
Size: 0.1- to 3-mm veins.
Minerals: Quartz, pyrite.
ADDITIONAL COMMENTS: 6-mm pyrite vein(?) or replacement of basalt clast cuts earlier pyrite and quartz vein in Piece 5. Common veins of pyrite plus quartz. 1- to 4-cm angular clasts of silicified basalt cut and cemented by quartz and pyrite veins. In SULFLOG Pieces 3 and 4 areType 10a, and Pieces 5 and 6 are Type 10b.



158-957M-8R-1

Pieces 1 and 2

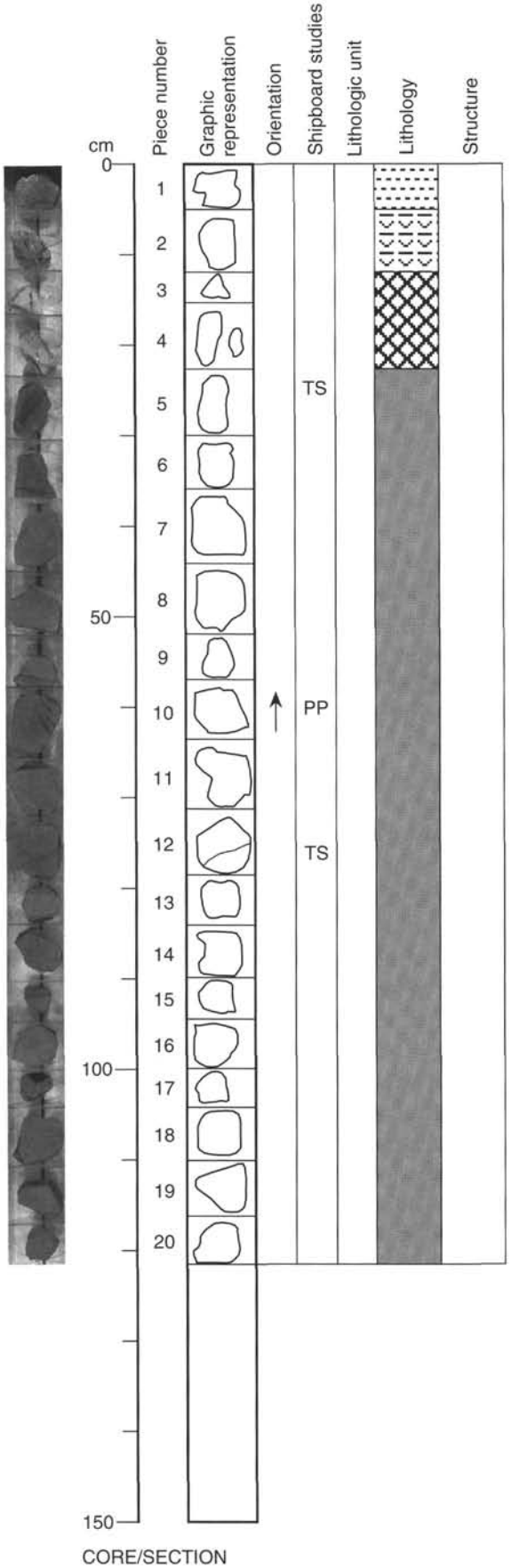
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, very fine- to medium-grained, euhedral, banded.
Silica, 10%, very fine-grained, dark, intergrown with pyrite in Piece 1.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, interstitial in pyrite.
TEXTURAL DESCRIPTION: Massive, clastic, layered. Porosity 15%.
ADDITIONAL COMMENTS: In Piece 2, recrystallized colloform bands are preserved.

Pieces 3–5 and 7–8

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 75%, very fine-grained, replacing basalt and in veins.
Pyrite, 15%, very fine- to fine-grained, disseminated and "veins" at the edge of fragments.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Clay minerals, 10%, replacing basalt clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Fe-oxide, angular centimeter-sized clasts of red chert in Piece 5.
Chalcopyrite, very fine-grained, mainly in Piece 7.
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 5%.
ADDITIONAL COMMENTS: Chalcopyrite is enriched in Piece 7 as late millimeter-sized veins and interstitial in pyrite. Piece 3 is less silicified and could be classified as Type 10b (chloritized basalt breccia).

Piece 6

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Dark gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 75%, very fine-grained, dark gray matrix and light gray clast.
Pyrite, 20%, very fine- to fine-grained, clasts or aggregates up to 2 mm.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, very fine-grained, disseminated in silica.
TEXTURAL DESCRIPTION: Breccia, clast supported. Porosity 5%.



158-957M-9R-1

Piece 1

ROCK TYPE: RED CHERT (Type 2)
CONTACTS: None.
COLOR: Red–gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 80%, very fine-grained, massive chert matrix.
Fe-oxides, 15%, very fine-grained, disseminated in silica matrix, coloring the chert.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, 5%, fine- to medium-grained, disseminated throughout the chert.
TEXTURAL DESCRIPTION: Very fine-grained red chert with patches of gray. Disseminated fine-grained pyrite in the chert and fine- to medium-grained pyrite in cavities. Porosity 2%.

Piece 2

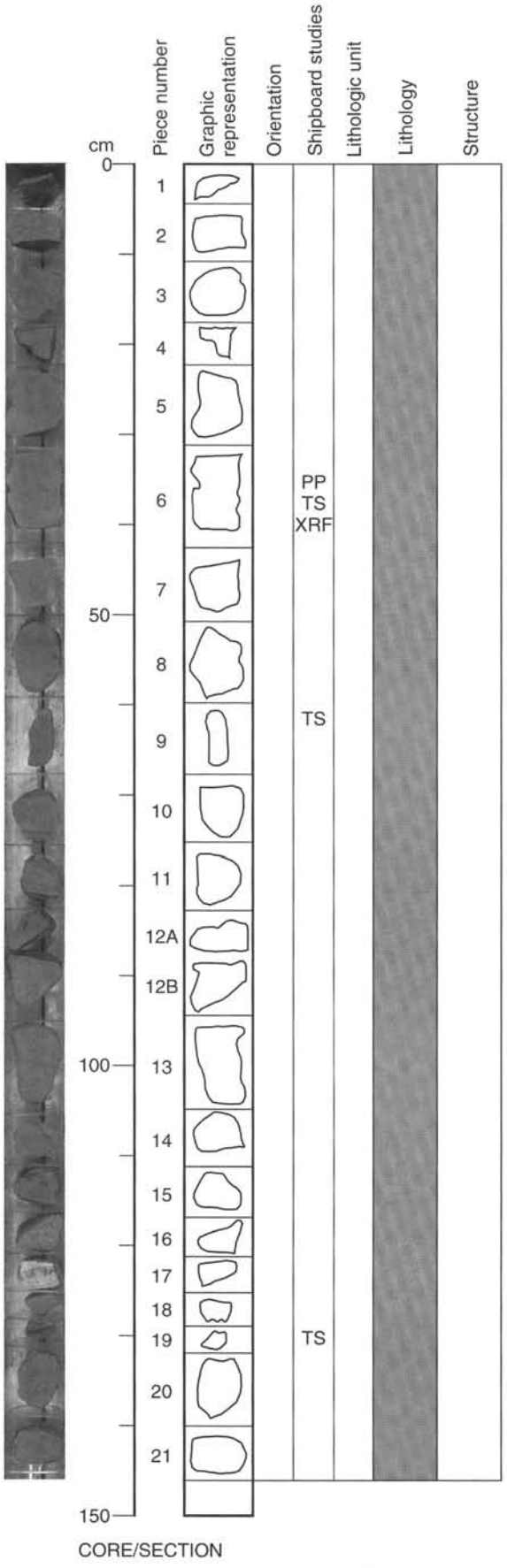
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Brassy yellow-green
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine- to coarse-grained, massive, porous, surrounding quartz-rich clasts.
Quartz, 40%, fine-grained, silicified areas and one silicified wallrock clasts.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, fine-grained, single aggregate (5 mm).
TEXTURAL DESCRIPTION: Silicified material in matrix of porous massive pyrite with pyrite cutting through the siliceous clasts. The outlines of the clasts are difficult to see. One silicified wallrock fragment (pyritized). Porosity 20%.
ADDITIONAL COMMENTS: Chalcopyrite occurs as single patch at the surface of the sample.

Pieces 3–4

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray–brassy yellow
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 70%, fine-grained, in silicified wallrock clasts.
Pyrite, 25%, fine- to coarse-grained, in porous veins and microveinlets.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chlorite, 5%, fine-grained, in silicified wallrock clasts.
TEXTURAL DESCRIPTION: Subangular to angular silicified wallrock fragments (up to 3 cm in diameter) cut by porous pyrite veins and veinlets (<1–8 mm). Porosity 10%.
VEINS:
Size: <1- to 8-mm veins.
Orientation: Irregular.
Minerals: Pyrite.
ADDITIONAL COMMENTS: Variolitic textures are preserved in Piece 3.

Pieces 5–20

UNIT 1: SPARSELY OLIVINE PHYRIC BASALT.
CONTACTS: None observed.
PHENOCRYSTS:
Olivine: 2%, <1 mm, euhedral.
Plagioclase: 2%, 1–2 mm, tabular to lath.
GROUNDMASS: Variolitic with plagioclase microlites and/or glass.
VESICLES: <1 mm, round, disseminated. Vesicles commonly filled to partially filled with smectite and chlorite. Other vesicles are lined with crystalline calcite.
COLOR: Dark gray.
STRUCTURE: Minor veining.
ALTERATION: At least 50% altered on margins; cores of pieces are fresher.
VEINS/FRACTURES: Trace, 1 mm. Rare veins, comprised of pyrite, chlorite, and an unidentified white mineral. One vein has a 1.5-mm-thick chloritized halo that also contains disseminated pyrite.
ADDITIONAL COMMENTS: Olivine is commonly completely (or nearly so) replaced by chlorite or an Fe-oxide/oxyhydroxide mineral. Commonly these are surrounded by disseminated pyrite. Concentric green chloritized halos are common on pieces, but not ubiquitous. In places it appears these halos may have been partially removed by the coring process. Halos are generally 0.5 to 5.0 mm wide on several pieces. These halos are distinctively rich in disseminated sulfides, comprising as much as 5%–10% of the rock. This sulfide-rich band grades inward from the rim of the pieces to red-stained, disseminated Fe-oxide/oxyhydroxides. Olivine pseudomorphs are present near the rims of these pieces. Fresh olivine grains are also present in the much less altered cores of pieces. Spinel grains are exposed on fresh surfaces.

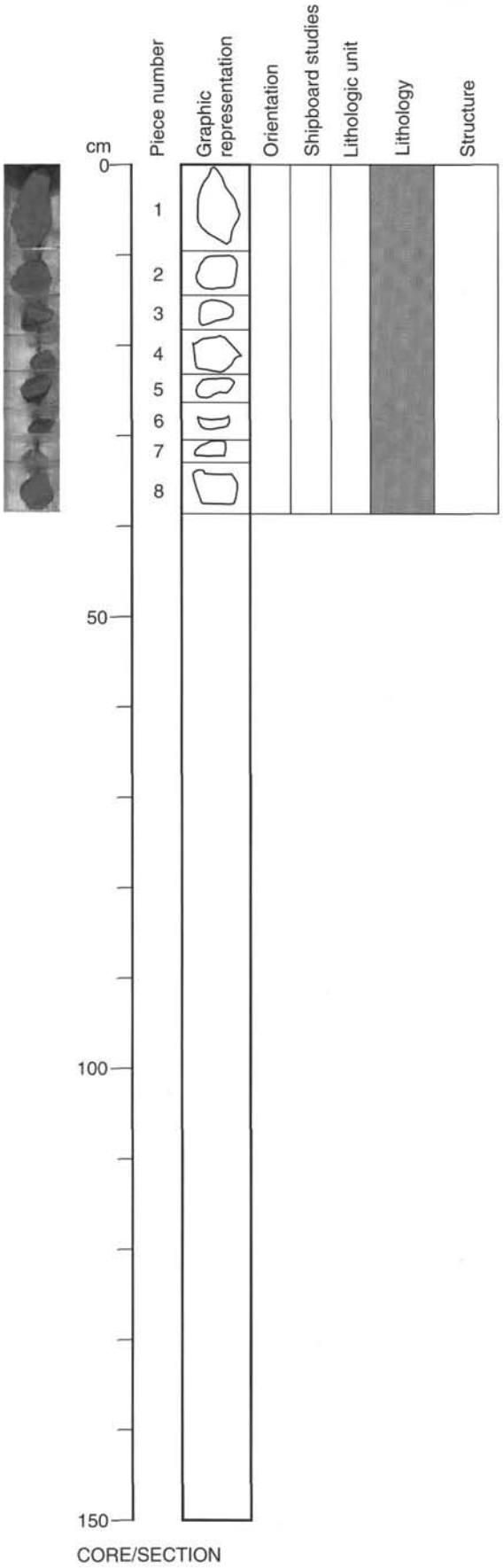


158-957M-10R-1

Pieces 1–21

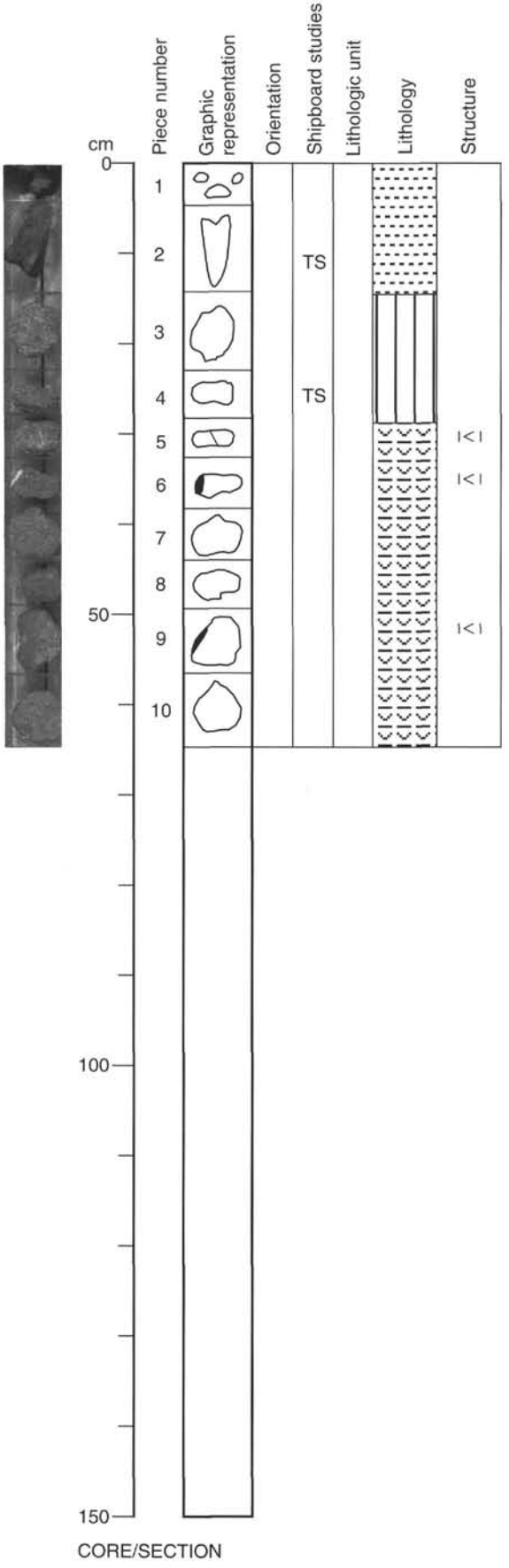
UNIT 1: SPARSELY OLIVINE PHYRIC BASALT
CONTACTS: None observed.
PHENOCRYSTS:
Olivine: 2%, <1 mm, euhedral.
Plagioclase: <2%, 1 mm, tabular to lath.
GROUNDMASS: Variolitic with plagioclase microlites.
VESICLES: <1%, <1 mm, round, disseminated. Rarely, vesicles exceed 2 mm in diameter. Most are encrusted to filled with a soft green phyllosilicate (smectite?) and minor calcite.
COLOR: Dark gray.
ALTERATION: Margins are commonly pervasively altered, whereas the cores of pieces are significantly less altered.
VEINS: Very thin (<<1 mm), discontinuous pyrite veins are present in some pieces. Rare fractures are lined with chlorite.
ADDITIONAL COMMENTS: Olivine, particularly near rims of pieces, is commonly altered and replaced by chlorite and Fe-oxides/oxyhydroxides. Away from altered rims some fresher olivine is present. Pieces 9 and 10 have intense alteration halos that are red brown and rich in Fe-oxides/oxyhydroxides. Piece 19 has a glassy rim and a dark red brown altered red core. Green alteration halos are still present, but not as common as in Section 158-957M-9R-1. Spinel grains (1 mm) are recognizable on freshly broken surfaces. Piece 17 is a silicified basalt with abundant pyrite and chalcopyrite disseminated throughout, but very abundant on and near the surfaces of this piece. Piece 17 is also vuggy and has red-stained Fe-oxides/oxyhydroxides.

158-957M-10R-2



Pieces 1–8

UNIT 1: SPARSELY OLIVINE PHYRIC BASALT
CONTACTS: None observed.
PHENOCRYSTS:
Olivine: 2%, <1 mm, euhedral.
Plagioclase: <2%, 1 mm, lath.
GROUNDMASS: Variolitic with plagioclase microlites and/or glass.
VESICLES: 1%–2%, <1 mm, round, disseminated.
COLOR: Dark gray.
ALTERATION: Margins of pieces are up to 50% altered, but cores appear less altered on freshly fractured surfaces.
ADDITIONAL COMMENTS: Green chloritized halos are present (1–5 mm thick). Olivine is extensively replaced, particularly near margins of grains. Disseminated pyrite is rare. Piece 7 appears to be a completely altered green pillow rim, containing a 3-mm-thick fine-grained vein, rich in pyrite. Vein has a distinct 1-mm-thick green halo mantled by a 2- to 3-mm-thick gray halo. Chalcopyrite is also encrusted on the outside of this piece.



158-957N-1W-1

Pieces 1–2

ROCK TYPE: GRAY CHERT (Type 3)
COLOR: Dark gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 90%, very fine-grained.
Pyrite, 10%, fine-grained, disseminated in silica and around silica clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristic
Sphalerite, 1%, fine-grained, euhedral crystals at the surface of the sample.
TEXTURAL DESCRIPTION: Clastic. Porosity 12%.
ADDITIONAL COMMENTS: Light gray silica clasts are depleted in pyrite inclusions.

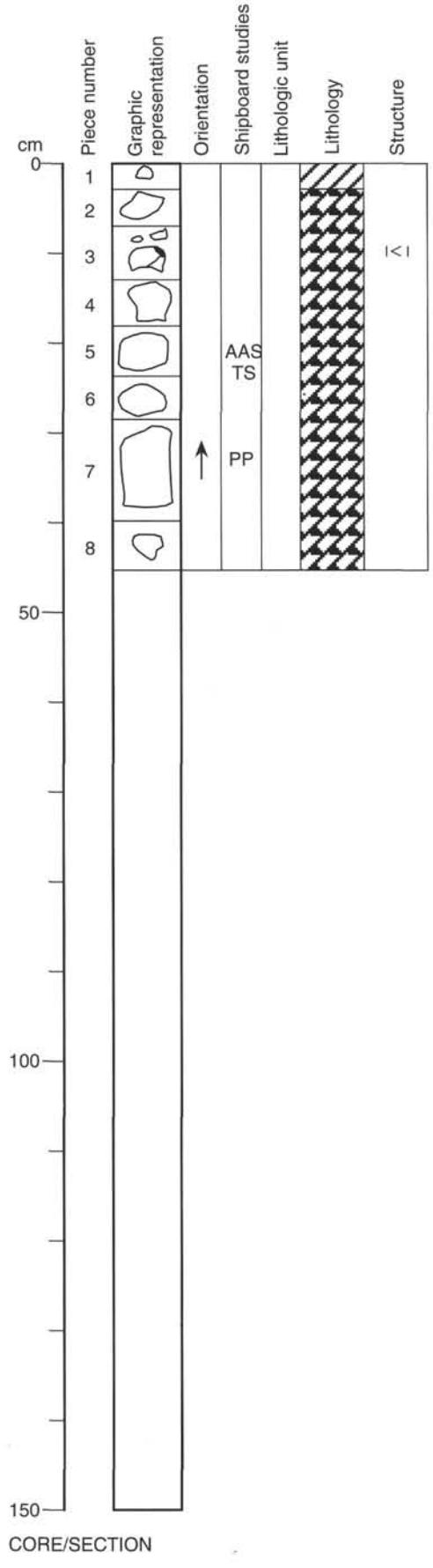
Pieces 3–4

ROCK TYPE: PYRITE-SILICA-ANHYDRITE BRECCIA (Type 8)
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 70%, very fine-grained, in matrix.
Pyrite, 20%, fine-grained, disseminated in matrix and as nodular clasts.
Anhydrite, 10%, as cement with silica, and millimeter-sized veins of white anhydrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristic
Fe-oxide, in red silicic clasts, irregularly disseminated in silica clasts.
Chalcopyrite, very fine-grained, centimeter-sized clastic aggregates in silica.
TEXTURAL DESCRIPTION: Matrix supported. Porosity 8%.
VEINS:
Size: 2 mm.
Mineral: White anhydrite.

Pieces 5–10

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 68%, very fine-grained, in matrix (dark gray) or in clasts (light gray).
Pyrite, 30%, very fine- to fine-grained, disseminated in matrix and nodules.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Anhydrite, 2%, disseminated in matrix (Piece 9) and veins (Piece 6).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristic
Fe-oxide, in red silicic clasts.
Chalcopyrite, millimeter-sized monominerallic clastic aggregates in silica matrix.
TEXTURAL DESCRIPTION: Matrix supported. Porosity 5%.
VEINS:
Size: 5 mm.
Mineral: White anhydrite.
ADDITIONAL COMMENTS: Many types of clasts (1 cm) are observed, including pyrite nodules, granular pyrite, red silica, light gray silica with disseminated pyrite, and altered basalt. Piece 5 has 10% anhydrite as 1-mm vein.

158-957O-2R-1

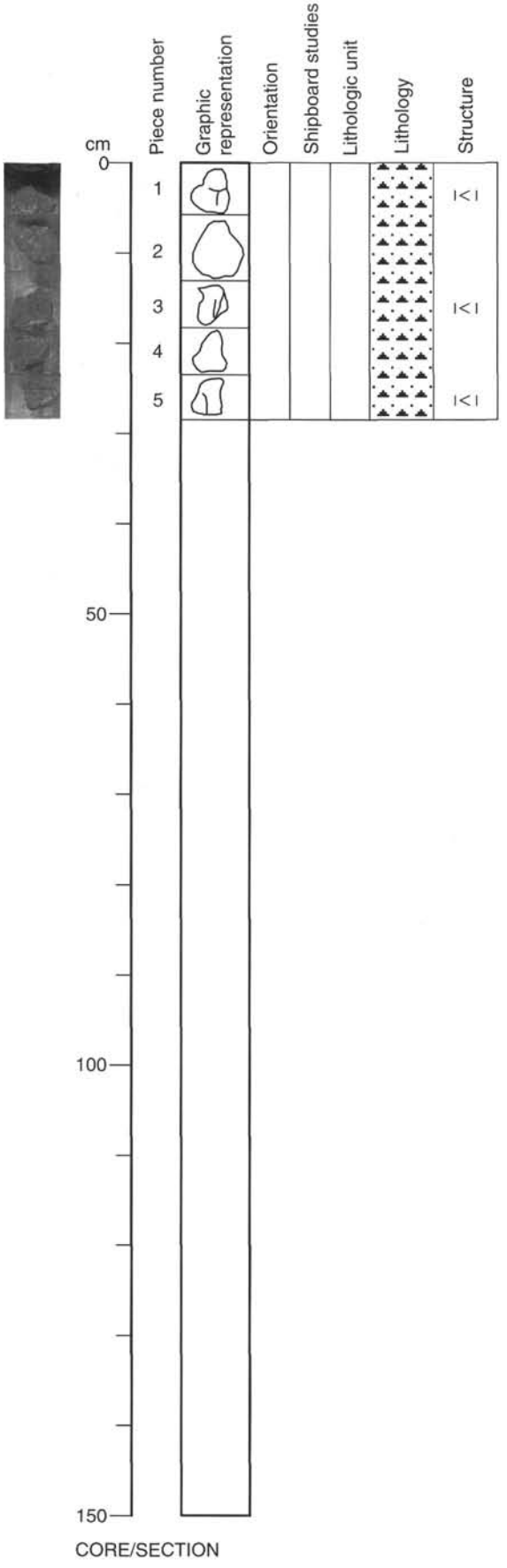


Piece 1

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Yellow gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, fine-grained, euhedral.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 10%, fine-grained, disseminated and interstitial, and in vein along one side of fragment.
TEXTURAL DESCRIPTION: Massive, porous.
VEINS:
Size: 0.5 mm.
Minerals: Chalcopyrite.
ADDITIONAL COMMENTS: This 2-cm, rounded piece was the only recovery from Core 158-957O-1R, so for convenience it is curated as part of Core 158-957O-2R.

Pieces 2–8

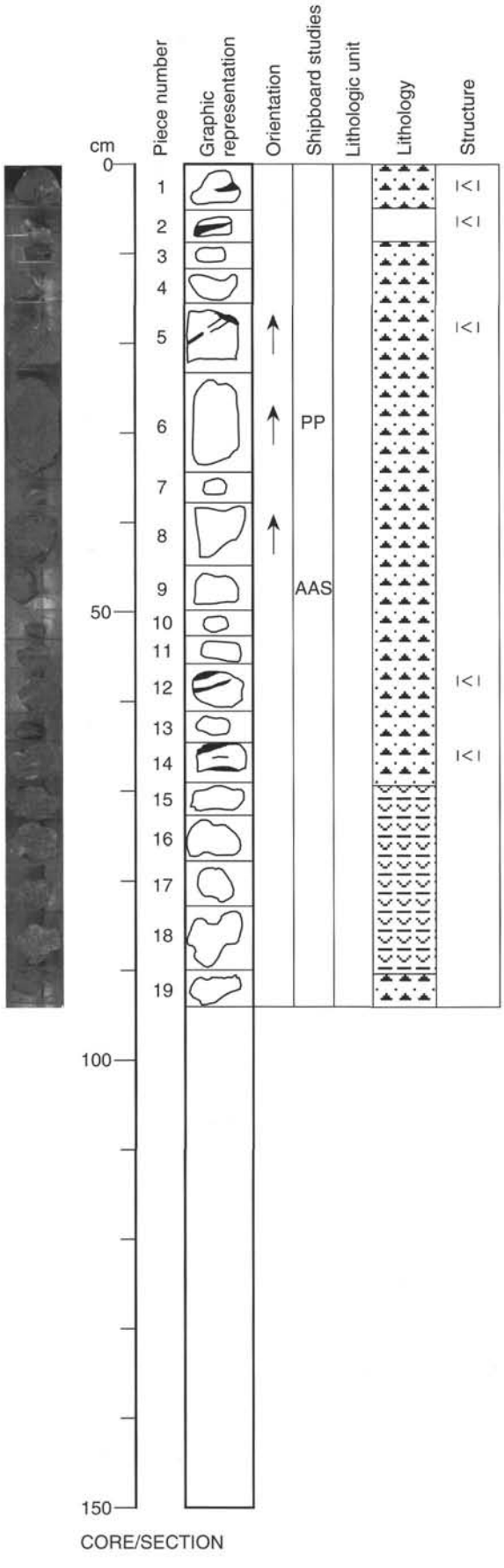
ROCK TYPE: NODULAR PYRITE BRECCIA (Type 6a).
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 75%, fine-grained, euhedral, 0.2-mm to 1-cm grains and rounded to angular aggregates.
Anhydrite, 13%, fine- to medium-grained, euhedral, matrix and 1-mm veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 7%, matrix.
Chalcopyrite, 5%, fine-grained, as millimeter-sized clasts, and disseminated in matrix and in clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Pyrrhotite, very fine-grained, euhedral boxwork aggregate associated with coarse-grained anhydrite, probably vein (Piece 2).
TEXTURAL DESCRIPTION: Breccia, nodular, clast-supported.
VEINS:
Size: 1 mm.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Mainly nodular breccia, but Pieces 3 and 7 contain some 1-cm fragments of angular massive granular pyrite. 1-mm anhydrite veins in Pieces 3 and 4. Piece 7 is more siliceous than the others.



158-957O-3R-1

Pieces 1–5

ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 45%, fine- to medium-grained, as small (<0.5 cm) granular aggregates and as larger clasts.
Anhydrite, 40%, fine- to medium-grained, as crystalline matrix material.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Silica, 10%, very fine-grained, dominantly as gray siliceous material (amorphous silica) rimming granular pyrite aggregates and clasts.
Chalcopyrite, 5%, fine-grained, as discrete granular aggregates or intergrown with pyrite in clasts.
TEXTURAL DESCRIPTION: Clast-rich, but dominantly matrix-supported.
VEINS: Minor anhydrite veining.
ADDITIONAL COMMENTS: Clasts as large as 2 cm of intergrown pyrite and chalcopyrite in a matrix of anhydrite and quartz. The matrix material contains abundant fine-grained, granular aggregates of pyrite and chalcopyrite. Most of the sulfides occur as <2- to 3-mm aggregates or clasts (80%); remainder are >0.5-cm clasts (20%). Clasts are variably rounded to angular; large clasts are dominantly angular and smaller clasts are nodular.



158-957O-4R-1

Pieces 1, 3–5, 11–14, and 19

ROCK TYPE: PYRITE-ANHYDRITE BRECCIA, VEIN-RELATED (Type 7d)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 30%–60%, fine- to medium-grained, banded in anhydrite veins.
Anhydrite, 35%–60%, very fine- to fine-grained, veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%–15%, fine- to medium-grained, bands of aggregates in anhydrite veins.
TEXTURAL DESCRIPTION: Medium- to fine-grained pyrite and chalcopyrite, commonly in layers, in various amounts of anhydrite vein material. Porosity 5%.
ADDITIONAL COMMENTS: Most of the sulfides seem to be within the anhydrite veins. Pyritization halos are less common.

Piece 2

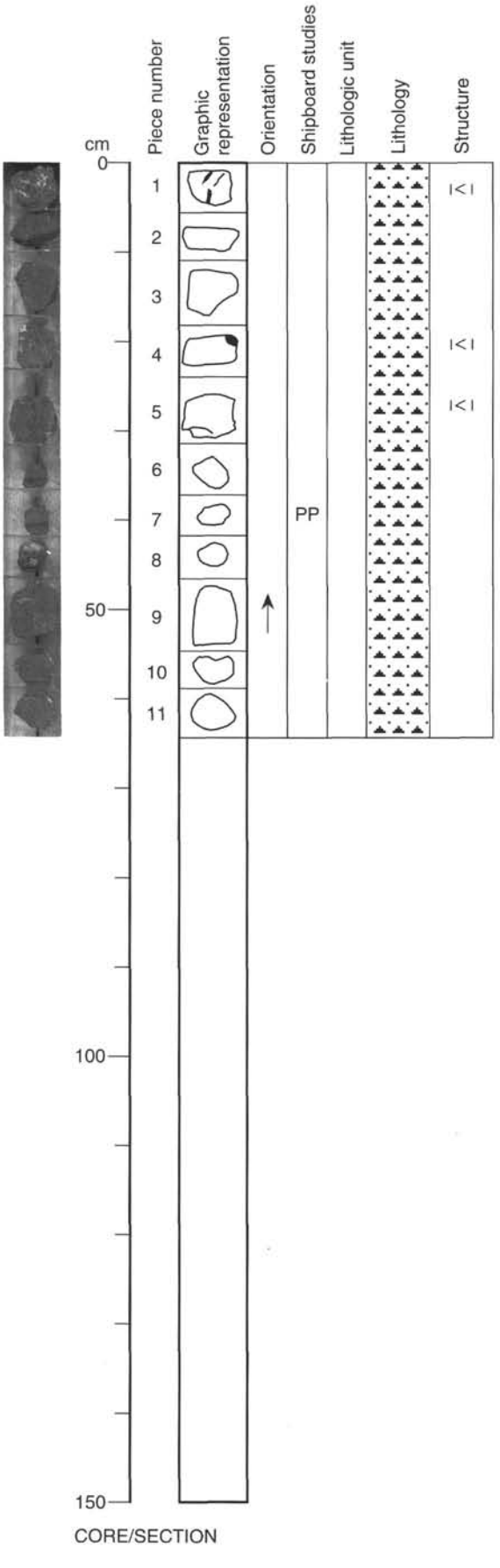
ROCK TYPE: ANHYDRITE VEIN (Type 11)
CONTACTS: None.
COLOR: White to yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 85%, medium- to coarse-grained, banded vein.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 10%, fine- to medium-grained, aggregates within vein.
Pyrite, 5%, fine-grained, disseminated in vein, associated with chalcopyrite.
TEXTURAL DESCRIPTION: Banded anhydrite vein with chalcopyrite and pyrite aggregates. Porosity 5%.
ADDITIONAL COMMENTS: Offshoots of chalcopyrite cut early anhydrite generations.

Pieces 6–10

ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Gray yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine- to medium-grained, pyrite clasts.
Anhydrite, 25%, fine- to coarse-grained, matrix.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, as aggregates and as inclusions in pyrite clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Quartz, fine-grained.
TEXTURAL DESCRIPTION: Pyrite clasts with minor chalcopyrite inclusions in anhydrite matrix; clast supported. Porosity 5%.
ADDITIONAL COMMENTS: Piece 7 is a pyrite clast, logged as massive granular pyrite. Piece 10 logged as massive granular pyrite.

Pieces 15–18

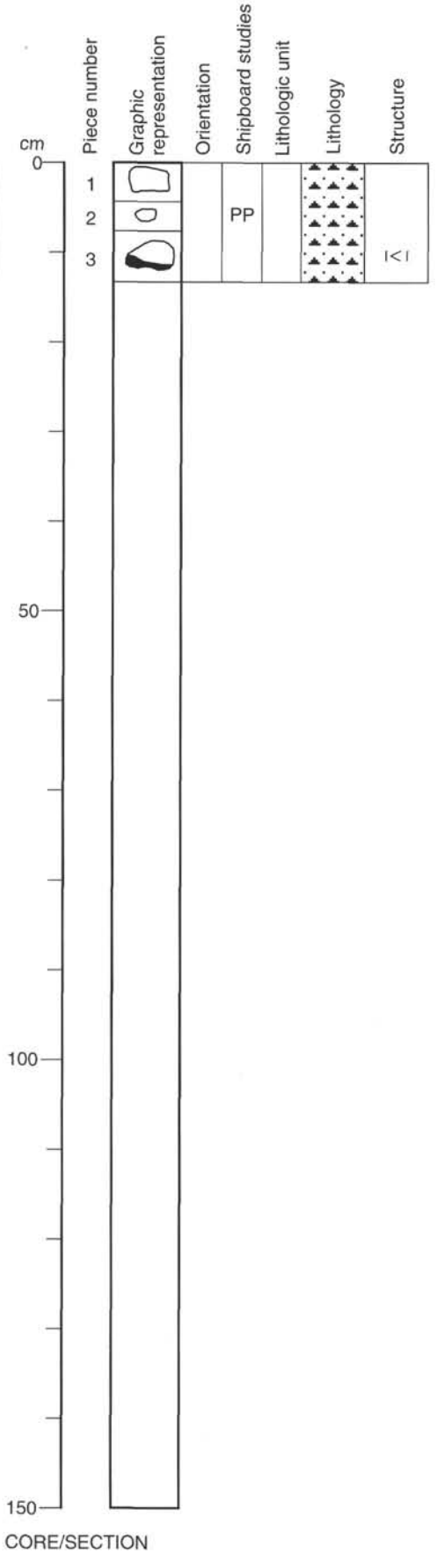
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 35%–60%, fine- to coarse-grained, massive pyrite clasts (up to 1.5 cm).
Quartz, 25%–50%, very fine- to fine-grained, dark gray matrix with disseminated pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite 10%–20%, fine- to coarse-grained, vein related and in vugs.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, disseminated aggregates.
TEXTURAL DESCRIPTION: Massive pyrite clasts in a gray silica and anhydrite matrix. Porosity 5%.
ADDITIONAL COMMENTS: Piece 15 has abundant massive pyrite and a clast of pyrite-silica breccia. Piece 18 contains several silicified wallrock fragments.



158-957P-1R-1

Pieces 1–11

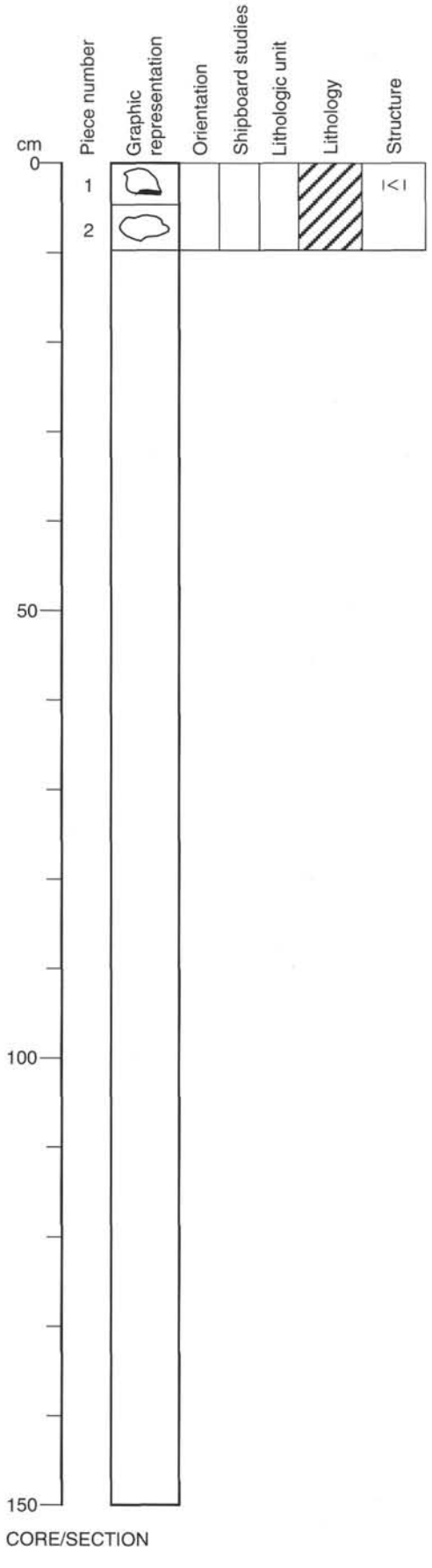
ROCK TYPE: MASSIVE PYRITE-ANHYDRITE BRECCIA (Type 7a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 65%, very fine- to fine-grained, euhedral, 0.2-mm to 1-cm grains and rounded to angular aggregates.
Anhydrite, 30%, fine- to medium-grained, euhedral, matrix and 1-mm veins.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, disseminated in pyrite and enriched in fine-grained pyrite clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, a trace in anhydrite in Piece 9.
Fe-oxide, regularly disseminated as small patches in anhydrite in Piece 10.
TEXTURAL DESCRIPTION: Breccia, nodular, clast-supported.
VEINS:
Size: 1 mm (Piece 9).
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Pieces 2 and 7 have lower anhydrite content (10%). Anhydrite grains in Piece 10 contain red Fe-oxide (hematite?), giving a red color to the sample. Piece 9 has a large (5 cm) brecciated clast of fine-grained massive pyrite with a network of small millimeter-sized anhydrite veins.



158- 957P-2R-1

Pieces 1–3

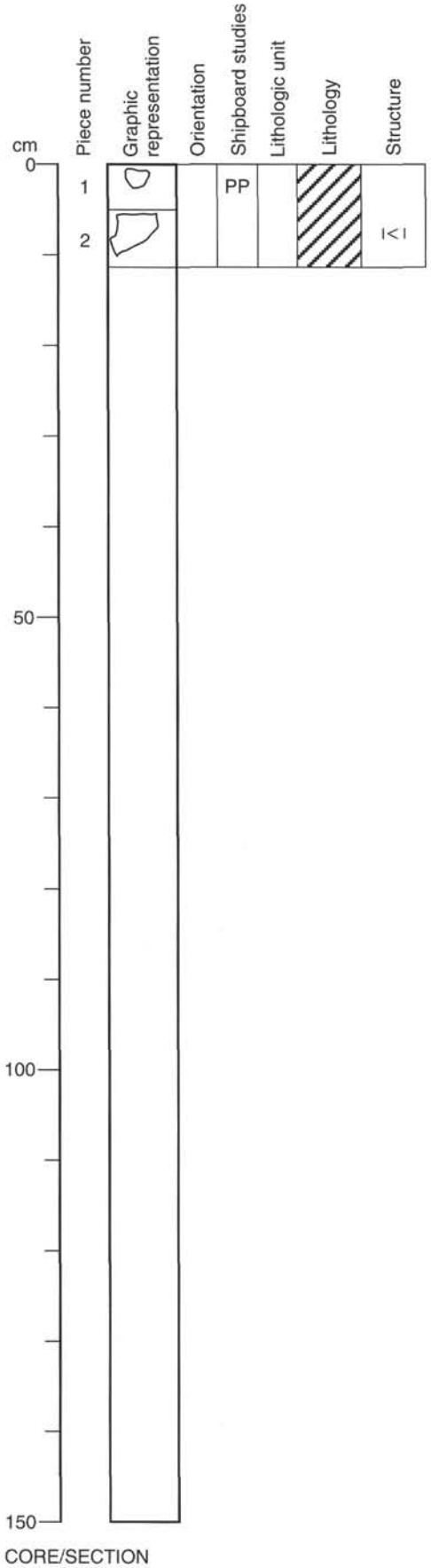
ROCK TYPE: NODULAR PYRITE-ANHYDRITE BRECCIA (Type 7b).
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 50%, fine- to coarse-grained, as <1-mm to 1.5-cm grains and rounded clasts.
Anhydrite, 50%, fine- to medium-grained, as matrix and 2-mm vein.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, very fine-grained, interstitial to pyrite.
TEXTURAL DESCRIPTION: Breccia, clast supported.
VEINS:
Size: 2 mm.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Rounded <1-mm to 1.5-cm clasts of massive pyrite in white anhydrite matrix. 2-mm anhydrite vein in Piece 3. Piece 2 is a 1.5-cm clast of massive granular pyrite, rimmed by anhydrite, from the breccia.



158-957P-3R-1

Pieces 1–2

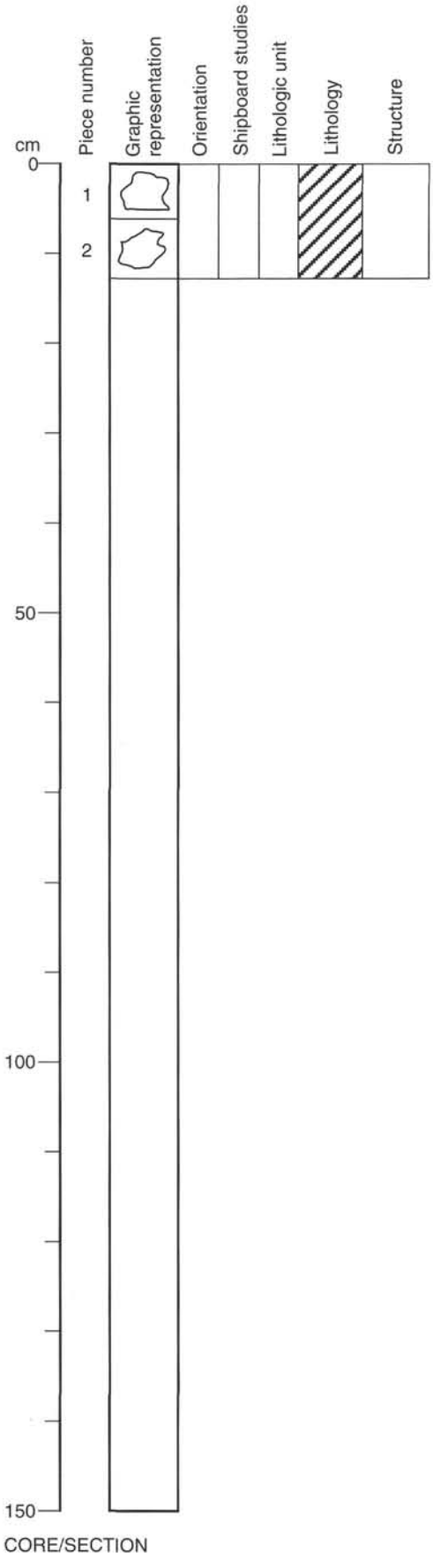
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c).
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%, very fine- to fine-grained, euhedral.
Anhydrite, 15%, very fine- to fine-grained, euhedral, interstitial, more abundant in Piece 1.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, disseminated in Piece 2 (chalcopyrite comprises 10% of Piece 2 but 5% of the core).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, interstitial in Piece 2.
TEXTURAL DESCRIPTION: Massive. Porosity 7%.
ADDITIONAL COMMENTS: Piece 2 has more of a recrystallized texture than Piece 1. Both pieces have 1- to 2-mm anhydrite coatings on their surfaces, and the anhydrite may be vein material.



158-957P-4R-1

Pieces 1–2

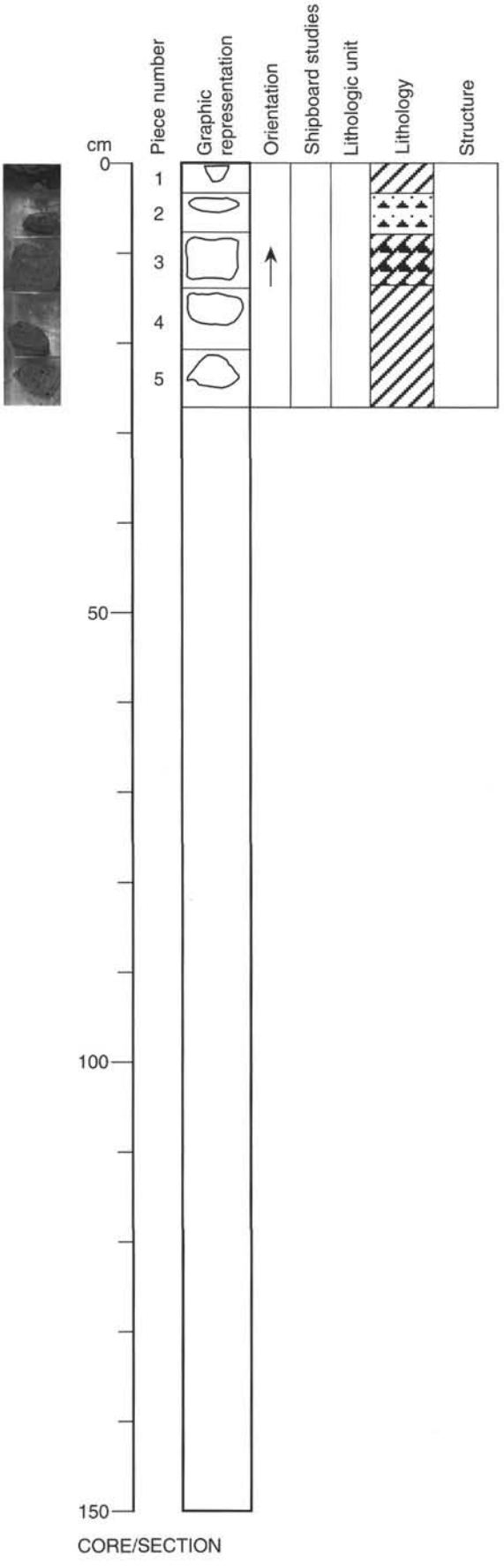
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c).
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine- to medium-grained, euhedral and polycrystalline aggregates.
Anhydrite, 10%, fine- to medium-grained, fills vugs and coats outer surfaces.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 8%, very fine-grained, in porous aggregates (clasts?).
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, interstitial, and as chert clast enclosed in pyrite in Piece 1.
TEXTURAL DESCRIPTION: Massive. Porosity 9%.
ADDITIONAL COMMENTS: One 2-mm clast of chert(?) in Piece 1.



158-957P-5R-1

Pieces 1–2

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, very fine- to fine-grained, euhedral and polycrystalline aggregates.
Anhydrite, 15%, fine- to medium-grained, fills vugs and coats outer surfaces.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 8%, very fine-grained, disseminated with pyrite in the matrix.
TEXTURAL DESCRIPTION: Massive. Porosity 7%.
VEINS:
Size: As thick as 8 mm.
Minerals: Anhydrite
ADDITIONAL COMMENTS: Banded anhydrite in Piece 2 grades to very fine disseminated pyrite (vein related?).



158-957P-6R-1

Pieces 1 and 4–5

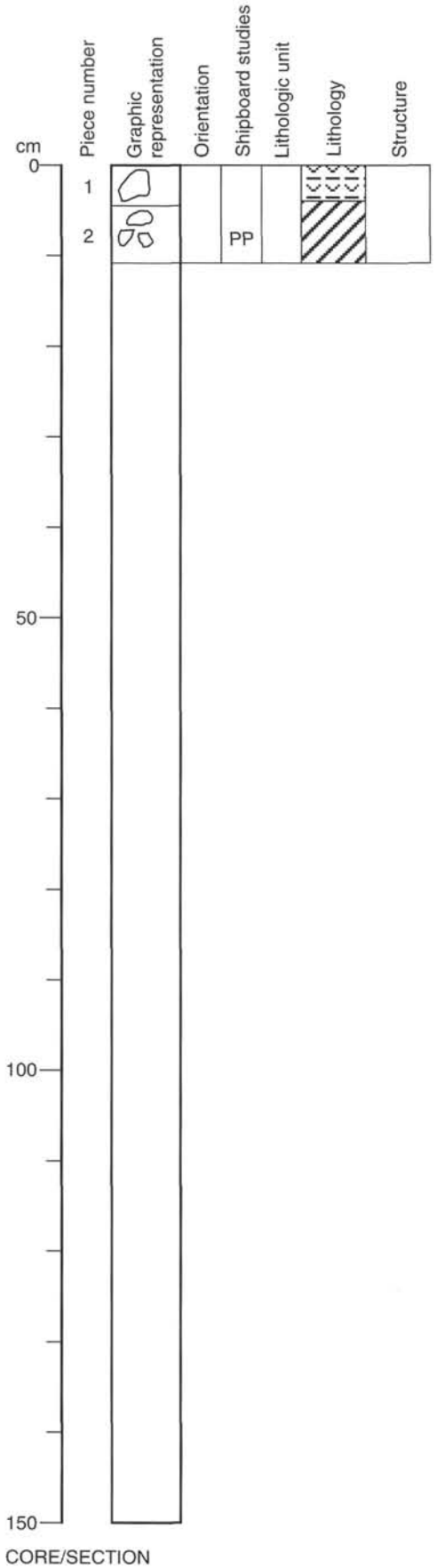
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine- to medium-grained, locally colloform with medium-grained pyrite euhedra lining open spaces, possible earlier marcasite overgrown by pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 2%, fine-grained, intergrown with pyrite.
Anhydrite, 3%, fine-grained, interstitial to massive colloform and aggregate pyrite.
TEXTURAL DESCRIPTION: Granular aggregates of pyrite up to 0.5 cm and massive colloform pyrite with interstitial anhydrite. Chalcopyrite locally overprinting pyrite.
ADDITIONAL COMMENTS: Piece 4: anhydrite vein, minor large pore spaces up to 3 mm.

Piece 2

ROCK TYPE: PYRITE-ANHYDRITE BRECCIA - Vein-related (Type 7d)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 60%, fine- to medium-grained, matrix, possibly vein related.
Pyrite, 40%, fine- to medium-grained, disseminated granular aggregates, dominantly euhedral grains.
TEXTURAL DESCRIPTION: Semi-massive pyrite, veined by anhydrite with laminated appearance.
ADDITIONAL COMMENTS: Granular aggregates of euhedral pyrite, locally grouped as apparent laminations, possibly vein-related.

Piece 3

ROCK TYPE: MASSIVE NODULAR PYRITE BRECCIA (Type 6a)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%, fine- to medium-grained, granular aggregates and clasts up to 1-cm, fine sandy matrix material.
Anhydrite, 10%, fine-grained, gray cement containing abundant fine, disseminated pyrite.
TEXTURAL DESCRIPTION: Angular, massive granular pyrite clasts or aggregates and nodular pyrite aggregates in sandy pyrite matrix.
ADDITIONAL COMMENTS: Matrix-supported pyrite breccia and granular aggregates with gray anhydrite cement.



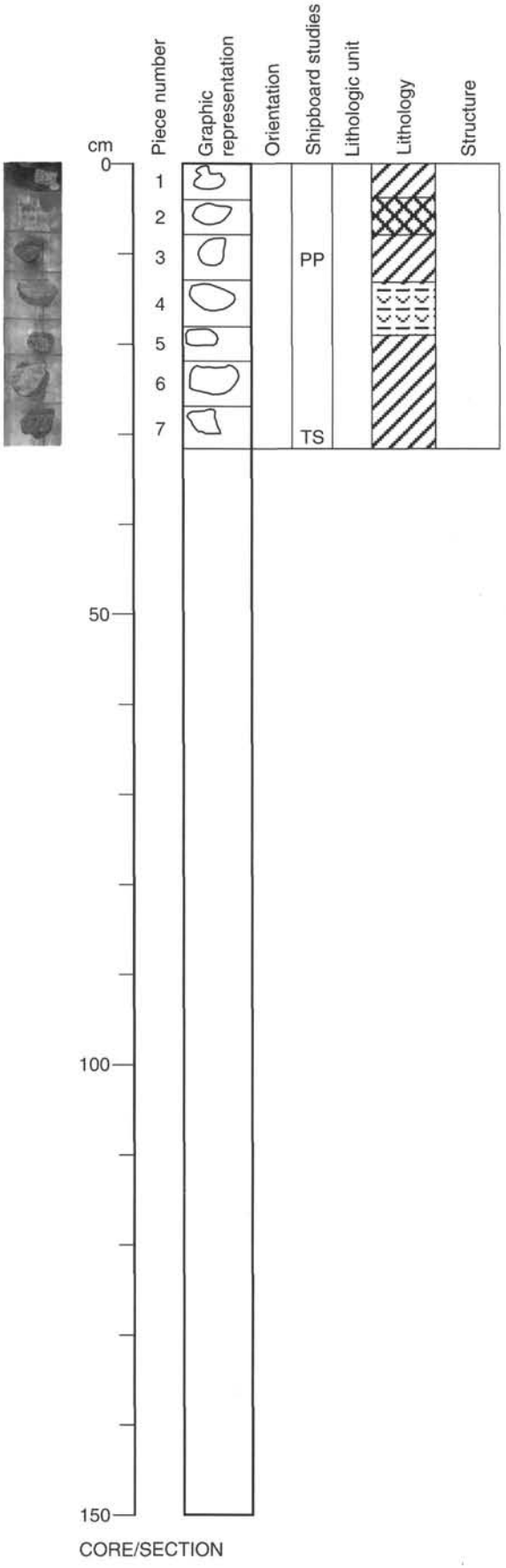
158-957P-7R-1

Piece 1

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Light gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 30%, fine- to medium-grained, disseminated pyrite as subhedral grains and granular aggregates up to 0.5 cm.
Quartz, 65%, fine-grained, gray siliceous matrix material.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, disseminated in quartz matrix. Locally as patches of several millimeters in diameter.
TEXTURAL DESCRIPTION: Fine-grained, uniformly disseminated pyrite and chalcopyrite (60% of sulfides) and granular aggregates (40% of sulfides).
ADDITIONAL COMMENTS: Quartz matrix is variably dark gray (surrounding pyrite aggregates) to white (between aggregates).

Piece 2

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 95%, fine- to medium-grained, massive aggregates of euhedral pyrite.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Chalcopyrite, 5%, fine-grained, intergrown with pyrite, locally as patches up to 3–4 mm long.
ADDITIONAL COMMENTS: Euhedral pyrite grains up to 1-mm lining cavities.



158-957P-8R-1

Pieces 1 and 5–6

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 90%–100%, fine- to coarse-grained, massive and granular.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, trace–10%, fine- to coarse-grained, euhedral crystals in vugs.
Quartz, trace–5%, fine-grained, lining vugs in pyrite, disseminated throughout pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, enriched layers in massive pyrite.
TEXTURAL DESCRIPTION: Massive granular pyrite with layers enriched in chalcopyrite. Rare anhydrite in vugs.
ADDITIONAL COMMENTS: Piece 1: coarse-grained rounded pyrite clast in granular pyrite matrix. Sample is partially rimmed by chalcopyrite.

Piece 2

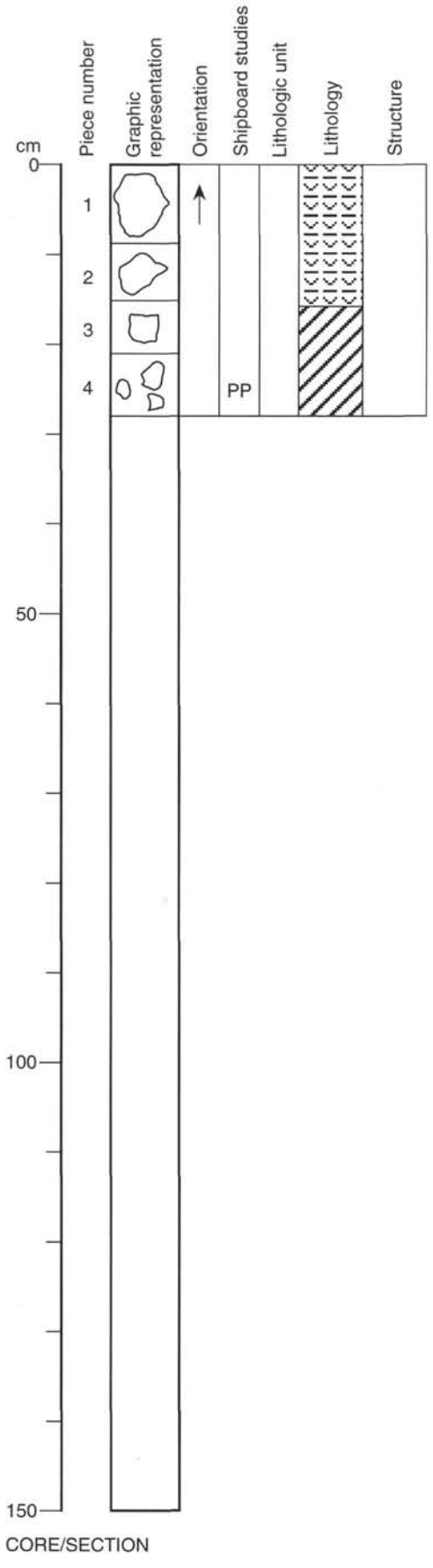
ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Gray white.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 88%, fine-grained, matrix and veins, in silicified wallrock fragments.
Pyrite, 10%, fine- to medium-grained, disseminated in matrix and wallrock fragments, veins cutting wallrock fragments.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Clay, 2%, very fine-grained, in silicified wallrock fragments.
TEXTURAL DESCRIPTION: Silicified wallrock fragments in quartz matrix, cut by quartz veins. Pyrite is disseminated throughout this sample. Pyrite veinlets in wallrock fragments.
ADDITIONAL COMMENTS: Colorless quartz veins cut wallrock fragments. Pyrite veinlets are <1-mm-wide in wallrock fragments.

Pieces 3 and 7

ROCK TYPE: POROUS MASSIVE PYRITE (Type 5a)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%–95%, fine- to coarse-grained, massive polycrystalline aggregates.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Anhydrite, trace to 15%, fine- to coarse-grained, filling pore space.
Chalcopyrite, fine- to medium-grained, disseminated in massive pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Silica, very fine-grained, botryoidal, lining vugs.
Pyrrhotite, fine-grained, euhedral grains associated with pyrite.
TEXTURAL DESCRIPTION: Porous massive pyrite with anhydrite filling pore space. Chalcopyrite occurs disseminated in massive pyrite. Sample 7 shows a porous core.
ADDITIONAL COMMENTS: Sample 7 shows botryoidal overgrowths in vugs and in places platy crystals (replacing pyrrhotite?). Pyrrhotite occurs as euhedral crystals associated with pyrite in the fine-grained porous core of Piece 7.

Piece 4

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray and brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 60%, fine-grained, matrix and pale gray quartz-rich clasts.
Pyrite, 40%, fine-grained, disseminated euhedral and polycrystalline aggregates.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, on the outside of the sample.
TEXTURAL DESCRIPTION: Pale gray angular quartz-pyrite fragments in matrix consisting of fine-grained angular to subrounded pyrite aggregates in dark gray silica.
ADDITIONAL COMMENTS: Pale gray fragments are rimmed by thin layer of pyrite (<1 mm) and fractured. Fractures are filled with matrix.



158-957P-9R-1

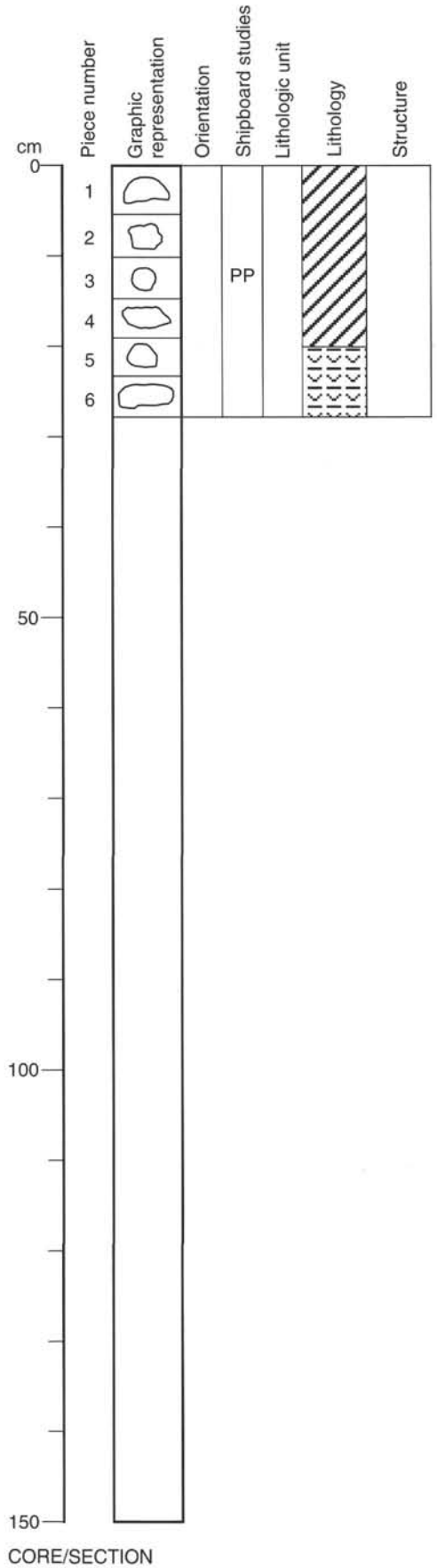
Pieces 1–2

ROCK TYPE: NODULAR PYRITE-SILICA BRECCIA (Type 9b)
CONTACTS: None.
COLOR: Gray to brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 40%–75%, fine-grained, dark gray silica matrix and quartz clasts.
Pyrite, 25%–60%, fine- to coarse-grained, nodular pyrite clasts, rimming quartz fragment.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, at the surface of the sample.
TEXTURAL DESCRIPTION: Nodular pyrite clasts (up to 1 cm in diameter) in dark gray silica matrix.
ADDITIONAL COMMENTS: Pale gray silica clast in Piece 1 is rimmed by 5 mm of pyrite. Dissolution is common around pyrite nodules. Piece 2 shows increasing pyrite content and is transitional to massive granular pyrite enclosing pyrite-silica breccias (Piece 3).

Pieces 3–4

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%–90%, fine- to coarse-grained, massive granular pyrite.
Quartz, 5%–20%, fine-grained, dark gray silica matrix.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine-grained, at the surface of the sample, vein related.
Chalcopyrite, fine- to medium-grained, disseminated aggregates, sometimes enriched in layers.
TEXTURAL DESCRIPTION: Massive granular pyrite cutting pyrite-silica breccia (Piece 3). Locally enriched in chalcopyrite.
ADDITIONAL COMMENTS: Piece 3 shows gradational boundaries between massive pyrite and pyrite-silica.

158-957P-10R-1

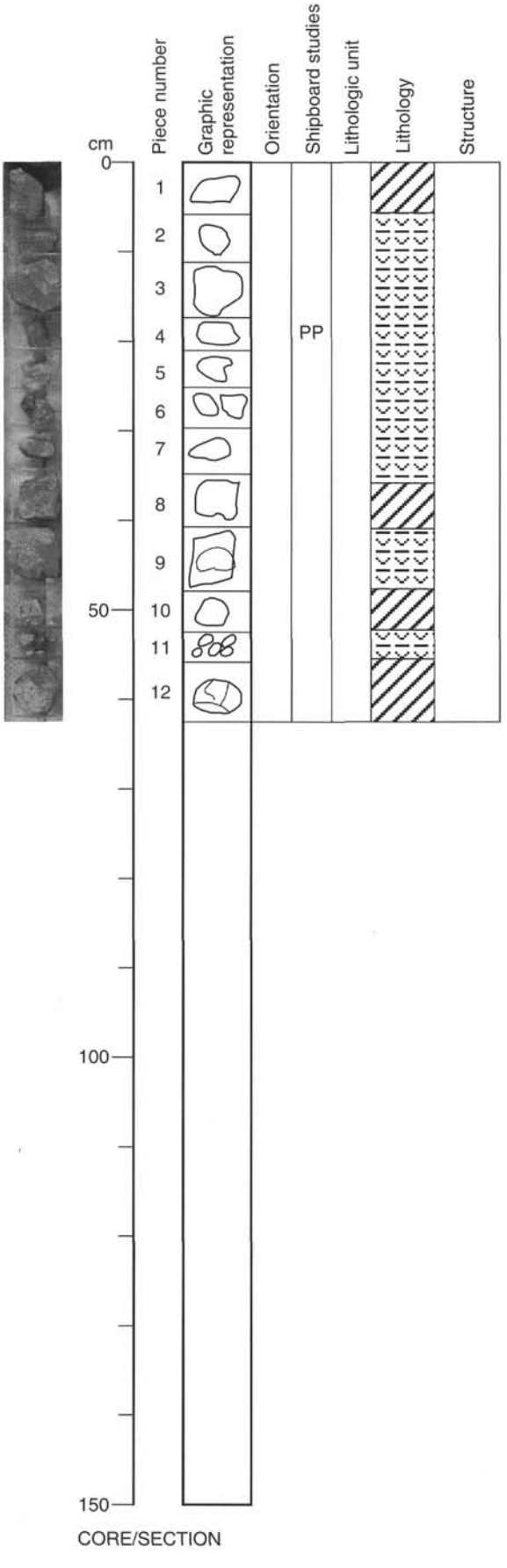


Pieces 1–4

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Brassy yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 80%, fine- to coarse-grained, euhedral massive granular pyrite. Larger crystals in open spaces with anhydrite.
Quartz, 15%, fine-grained, light gray silica clasts with minor pyrite and locally interstitial within pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, 2%, fine-grained, euhedral, in open spaces and at the surface of the sample.
Chalcopyrite, 3%, fine-grained, disseminated in pyrite and interstitial.
TEXTURAL DESCRIPTION: Massive granular pyrite intruding into pyrite-silica breccia (Piece 3). Locally enriched in chalcopyrite. Porosity 10%.
VEINS:
Size: 1 mm.
Minerals: Pyrite in silica clasts.

Pieces 5–6

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 59%, very fine-grained, dark gray silica matrix and quartz clasts.
Pyrite, 40%, very fine- to medium-grained, <1-cm-sized clasts, rimming quartz fragment, and 5-mm vein with coarser grains around the sample.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, 1%, fine-grained, with massive pyrite vein on the surface of the pieces.
TEXTURAL DESCRIPTION: Pyrite clasts (up to 1 cm in diameter), in dark gray silica matrix.
VEINS:
Size: 5 mm.
Minerals: Pyrite and some anhydrite on the outer part of Piece 6.



158-957P-11R-1

Pieces 1, 8, 10, and 12

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 92%, fine-grained, euhedral, massive, recrystallized.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Silica, 5%, very fine-grained, in 5-mm to 1-cm rounded clasts, interstitial.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristic
Anhydrite, fine-grained, euhedral in open spaces and on broken surfaces.
Chalcopyrite, fine-grained, interstitial, lining pores.
TEXTURAL DESCRIPTION: Massive, granular, recrystallized. Porosity 5%.

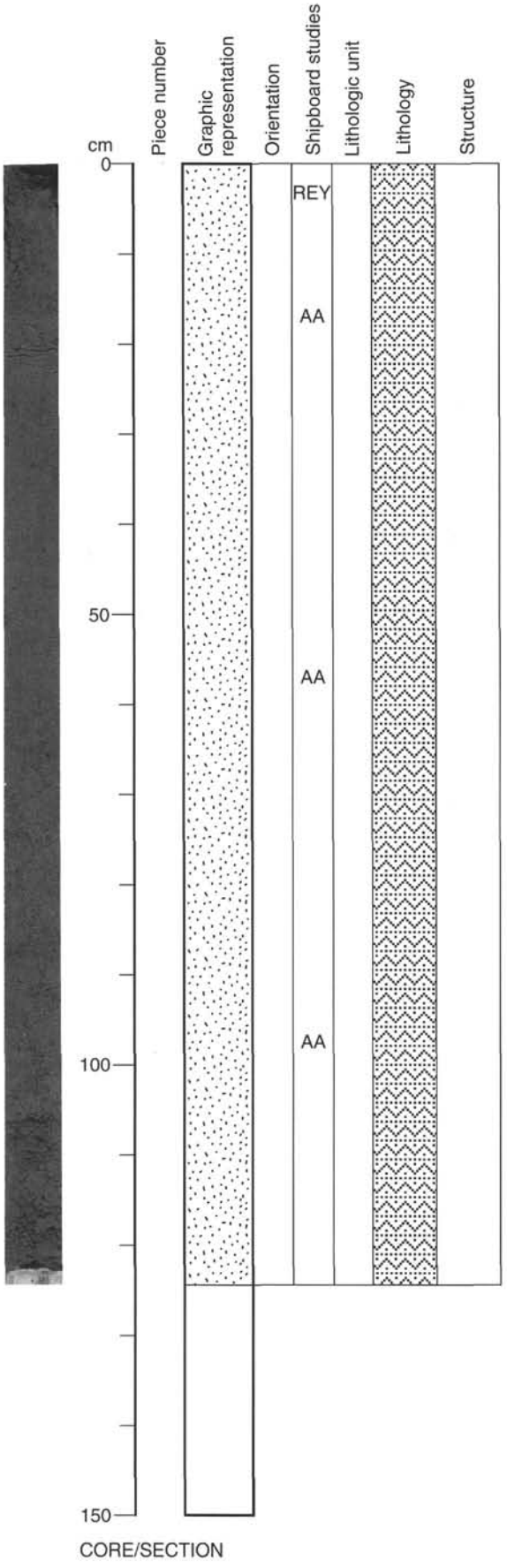
Pieces 2–7, 9, and 11

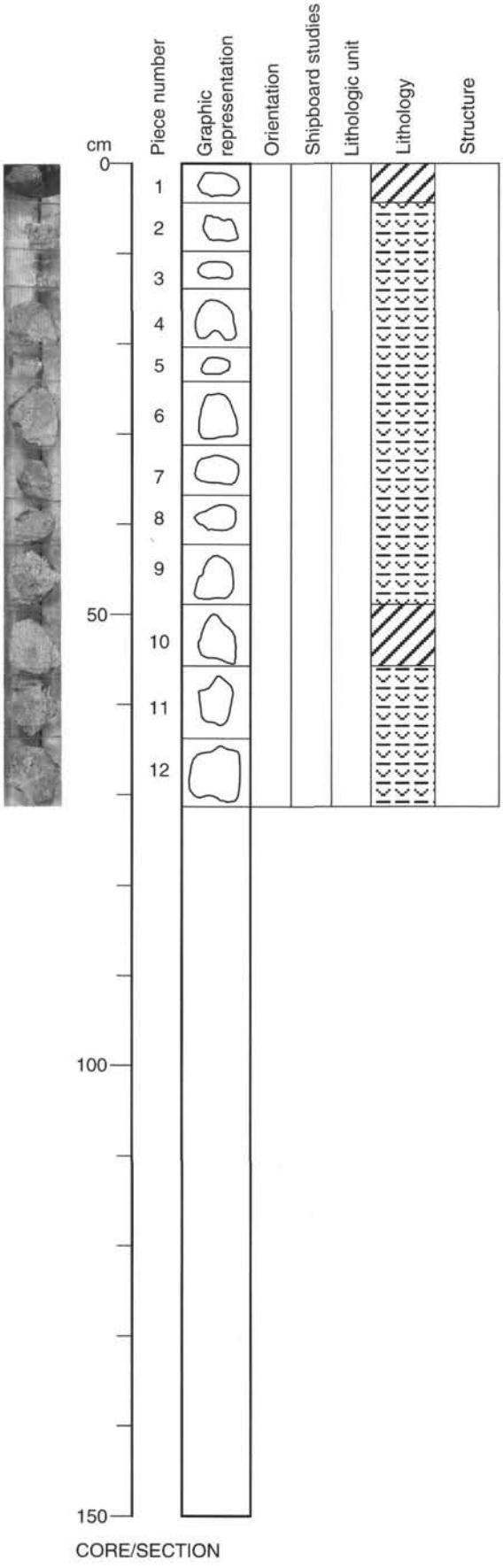
ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a)
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 70%, very fine-grained, dark gray silica matrix and white quartz veins cutting basalt clasts, replacing basalt clasts.
Pyrite, 27%, fine-grained, euhedral disseminated in basalt clasts, 0.1- to 5-mm grains and aggregates disseminated in gray quartz matrix.
MINOR MINERALS
Name, Size, Included in, Characteristics
Chlorite, 2%, replacing basalt clasts.
TRACE MINERALS (<2%)
Name, Size, Included in, Characteristic
Anhydrite, fine-grained, on broken surfaces and filling cracks.
Chalcopyrite, fine-grained, disseminated but concentrated in 1-cm massive pyrite vein in Piece 9.
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 5%.
VEINS:
Size: 0.5–10 mm.
Minerals: Pyrite, quartz, chalcopyrite, anhydrite.
ADDITIONAL COMMENTS: 5-mm to 3-cm silicified basalt clasts, cut by quartz and pyrite veins. 1-cm massive pyrite-chalcopyrite on one side of Piece 9, vein(?). Quartz plus pyrite breccia matrix truncates pyrite and quartz veins in basalt clasts. Late 0.1- to 1-mm pyrite veins cut quartz and pyrite matrix. Later anhydrite fills open spaces in late pyrite veins. Piece 5 logged as silicified wallrock breccia.

158-957P-12R-1

Pieces 0–124 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, very fine- to fine-grained.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Anhydrite, fine-grained.
Quartz, fine-grained.
ADDITIONAL COMMENTS: Drilling- and circulation-sorted pyrite, anhydrite, and silica sand.





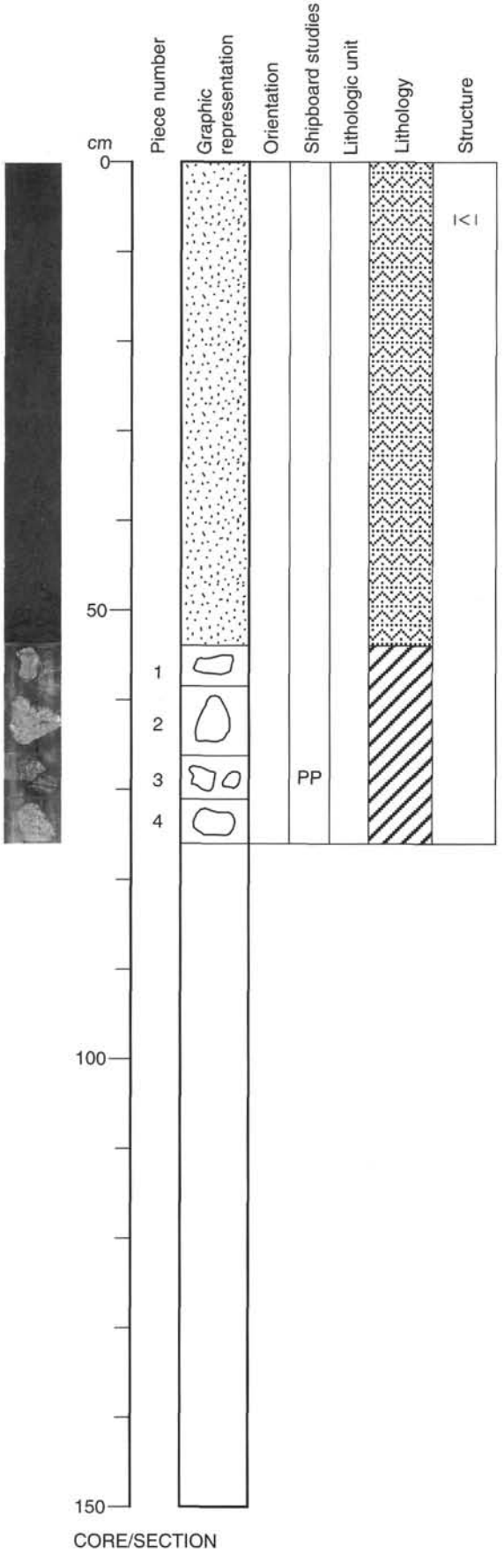
158-957P-12R-2

Pieces 1 and 10

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow-green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 85%, fine-grained, euhedral, massive.
MINOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Anhydrite, 15%, fine-to coarse-grained , euhedral, in 1- to 3-mm veins.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chlorite, very fine-grained, on broken surfaces on Piece 1.
Chalcopyrite, fine-grained, interstitial in Piece 1.
Silica, very fine-grained, interstitial in Piece 10.
TEXTURAL DESCRIPTION: Massive granular, recrystallized, veined. Porosity 5%.
VEINS:
Size: 1–3 mm.
Minerals: Anhydrite.
ADDITIONAL COMMENTS: Piece 1 may be a fragment of a massive pyrite vein. Mineral sequence in vein is pyrite, then chalcopyrite, then anhydrite.

Pieces 2–9 and 11–12

ROCK TYPE: PYRITE-SILICA BRECCIA (Type 9a) WITH SILICIFIED BASALT CLASTS
CONTACTS: None.
COLOR: Gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Quartz, 72%, very fine-grained, dark gray to white breccia matrix replacing basalt clasts.
Pyrite, 25%, fine-grained, 0.1- to 5-mm grains and aggregates to massive matrix in Piece 11.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Clay (chlorite?), 3%, very fine-grained, replacing basalt clasts.
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 5%.
ADDITIONAL COMMENTS: <1- to 4-cm rounded to angular silicified basalt clasts in dark gray silica pyrite matrix, cut by quartz and pyrite veins. Matrix is more pyrite rich in Pieces 9, 11, and 12. All pieces in this section were dug out of pyrite sand of Section 158-957P-12R-1, 107–140 cm. Two generations of brecciation and cementation by quartz. First generation is altered basalt cemented by light gray quartz and minor silica. Second generation is brecciation of the first assemblage and cementation by massive pyrite with minor silica and anhydrite.



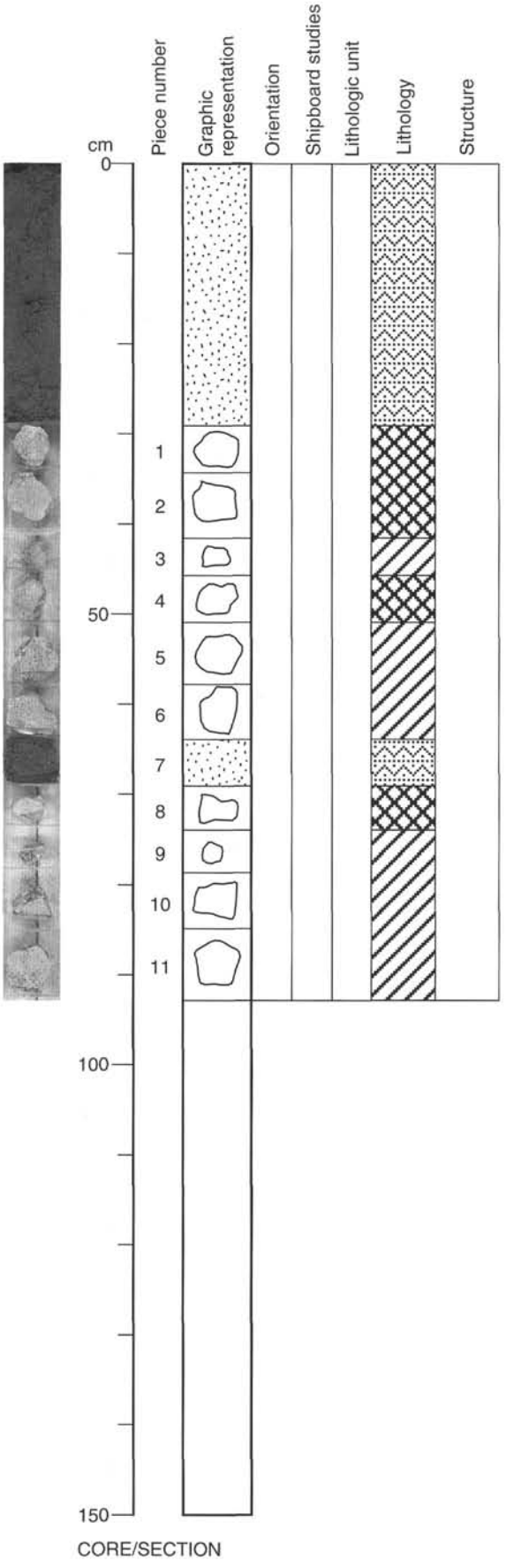
158-957P-12R-3

Pieces 0–55 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, very fine- to fine-grained.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Anhydrite, fine-grained.
Quartz, fine-grained.
ADDITIONAL COMMENTS: Drill cuttings. Pyrite, anhydrite, and silica sand.

Pieces 1–4

ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c)
CONTACTS: None.
COLOR: Yellow green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 70%, fine- to medium-grained, euhedral, as cement around clasts.
Silica, 29%, very fine-grained, in clasts replacing basalt, less commonly interstitial in pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to medium-grained, euhedral on broken surfaces.
TEXTURAL DESCRIPTION: Massive granular, with silica clasts. Porosity 15%.
ADDITIONAL COMMENTS: Most clasts (<3 cm) are probably basalt fragments. Pieces 2 and 4 logged as pyrite-silica breccia.



158-957P-12R-4

Pieces 0–30 cm and 65–70 cm, Piece 7

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Green.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, very fine- to fine-grained.
MINOR MINERALS:
Name, Size, Included in, Characteristics
Anhydrite, fine-grained.
Quartz, fine-grained.
ADDITIONAL COMMENTS: Drill cuttings. Pyrite, anhydrite, and silica sand.

Pieces 1–2, 4, and 8

ROCK TYPE: SILICIFIED WALLROCK BRECCIA (Type 10a)
CONTACTS: None.
COLOR: Green gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 50%–80%, very fine-grained, matrix and replacing basalt.
Pyrite, 15%–50%, fine-grained, disseminated in silica or as cement (or veins) around clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to coarse-grained, euhedral, on broken surfaces.
Chalcopyrite, very fine- to fine-grained, disseminated in pyrite associated with anhydrite.
Clay or chlorite, replacing basalt.
TEXTURAL DESCRIPTION: Breccia, matrix supported. Porosity 5%.
VEINS:
Size: <1 mm.
Minerals: Pyrite or quartz.
ADDITIONAL COMMENTS: Silicified basalt with disseminated pyrite in massive granular pyrite (± silica, ± anhydrite) matrix or vein.

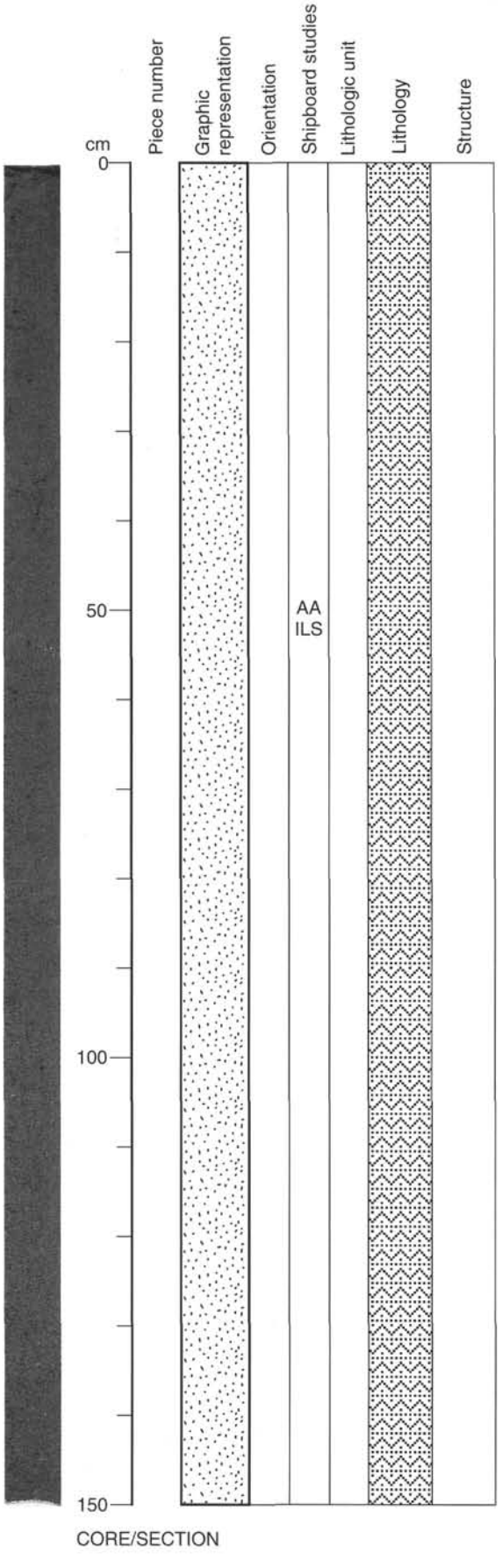
Pieces 3, 5–6, and 9–11

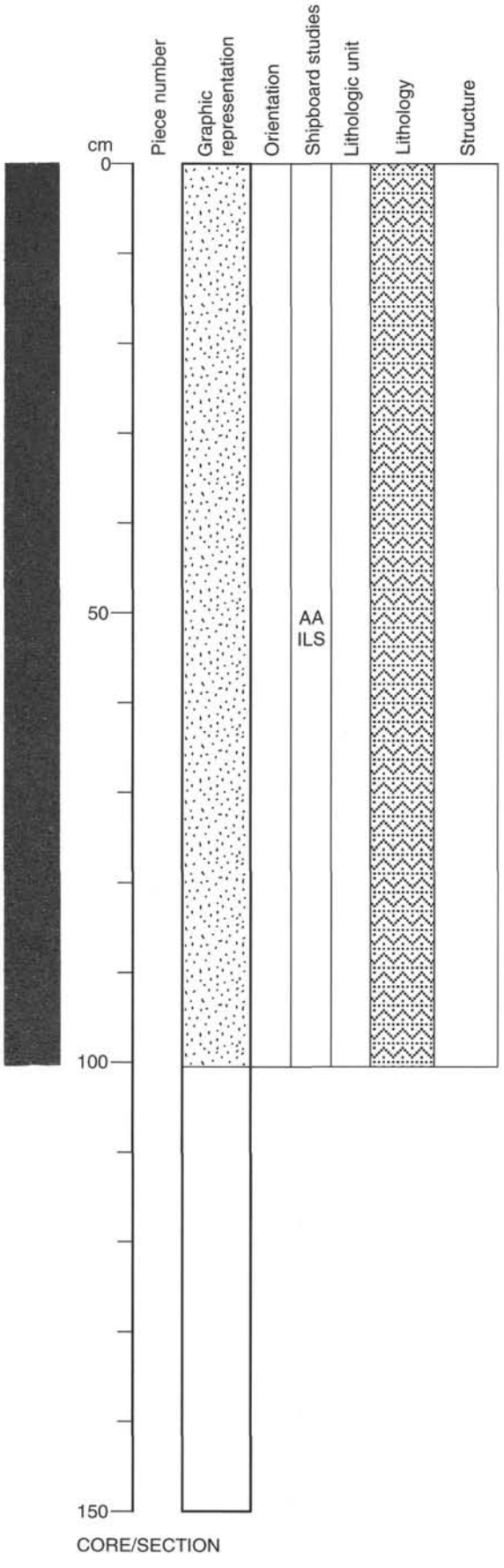
ROCK TYPE: MASSIVE GRANULAR PYRITE (Type 5c) with altered basalt clasts.
CONTACTS: None.
COLOR: Yellow.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 65%–95%, fine- to medium-grained, euhedral.
Silica, 5%–35%, very fine-grained, replacing basalt in clasts or interstitial.
MINOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Chalcopyrite, 3%, very fine- to fine-grained, disseminated in pyrite.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Anhydrite, fine- to medium-grained, euhedral, on broken surfaces or in vugs.
TEXTURAL DESCRIPTION: Massive granular. Porosity 10%.
ADDITIONAL COMMENTS: Massive pyrite with 1- to 3-cm silicified basalt clasts.

158-957P-13W-1

Pieces 0–150 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brass yellow.
TEXTURAL DESCRIPTION: Drill cuttings consisting of pyrite-anhydrite sand and gravel with dark gray to black chert clasts (as large as 8 mm). This section is finer grained than Section 158-957P-13W-2. Because this core was brought up as a wash barrel, an interlaboratory sulfide standard was collected for distribution to the scientific party. Splits of this standard are archived with the core.





158-957P-13W-2

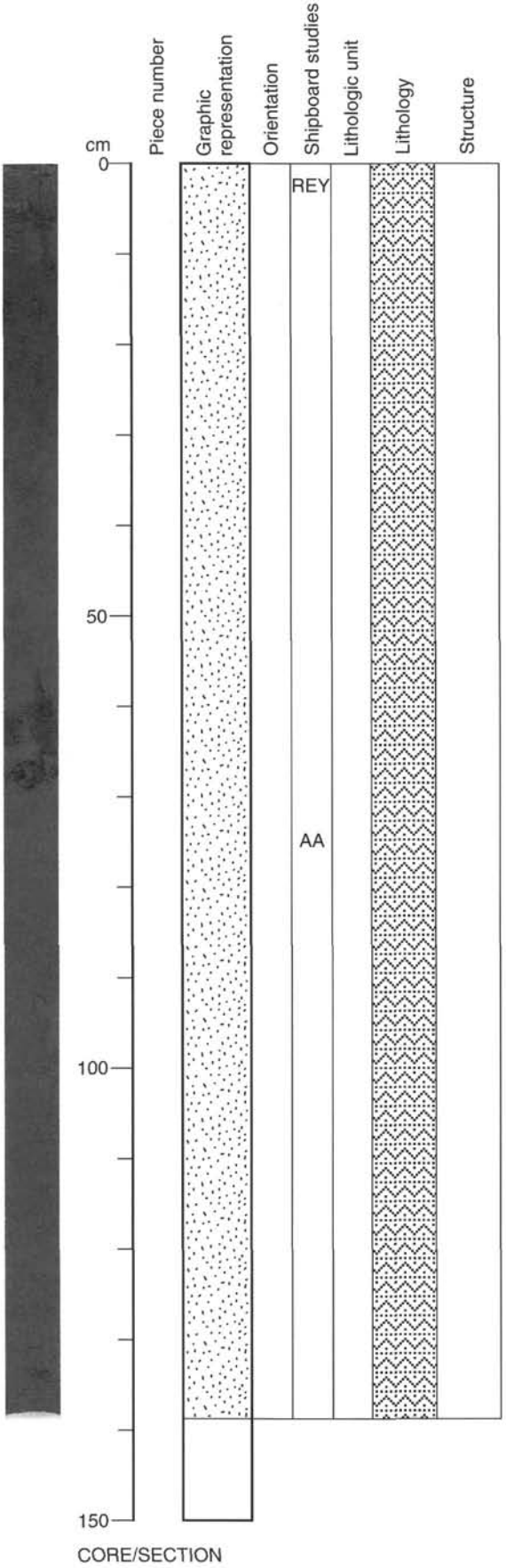
Pieces 0–100 cm

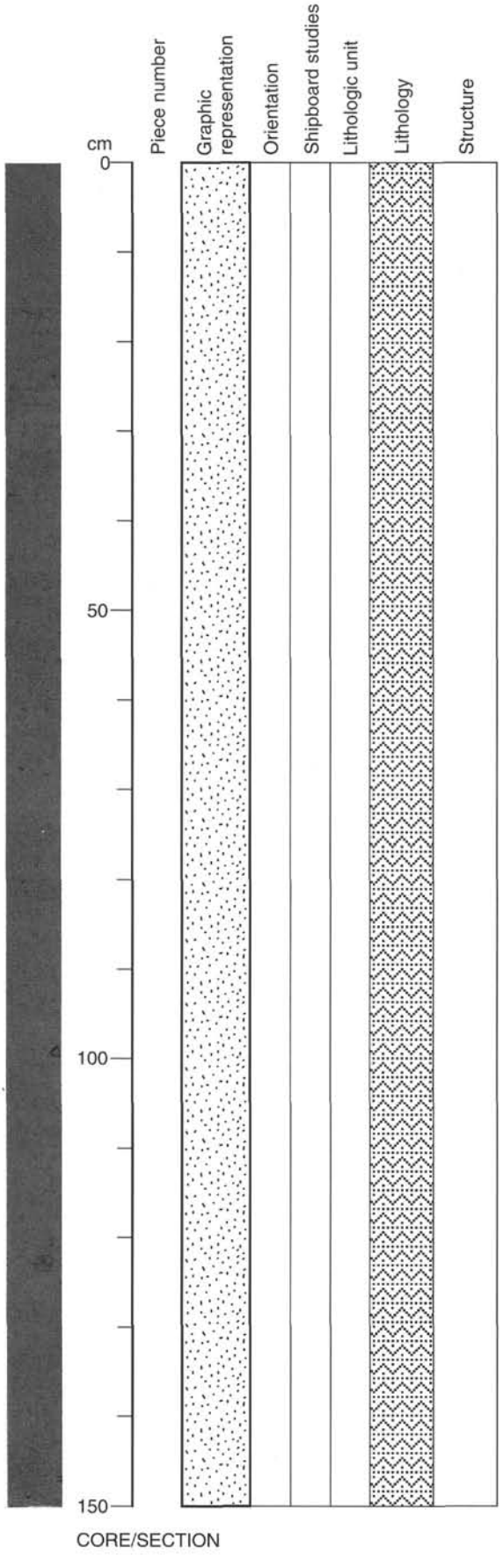
ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brass yellow.
TEXTURAL DESCRIPTION: Drill cuttings consisting of pyrite-anhydrite sand and gravel with dark gray to black chert clasts (as large as 8 mm). This section is coarser grained than Section 158-957P-13W-1. Because this core was brought up as a wash barrel, an interlaboratory sulfide standard was collected for distribution to the scientific party. Splits of this standard are archived with the core.

158-957Q-1R-1

Pieces 0–139 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brassy yellow and red.
TEXTURAL DESCRIPTION: Section consists of pyrite and red chert drill cuttings with partially silicified Fe-oxides. This section contains the finest grain size material in Core 158-957Q-1R. Grain size increases downsection, but this is most likely circulation induced.





158-957Q-1R-2

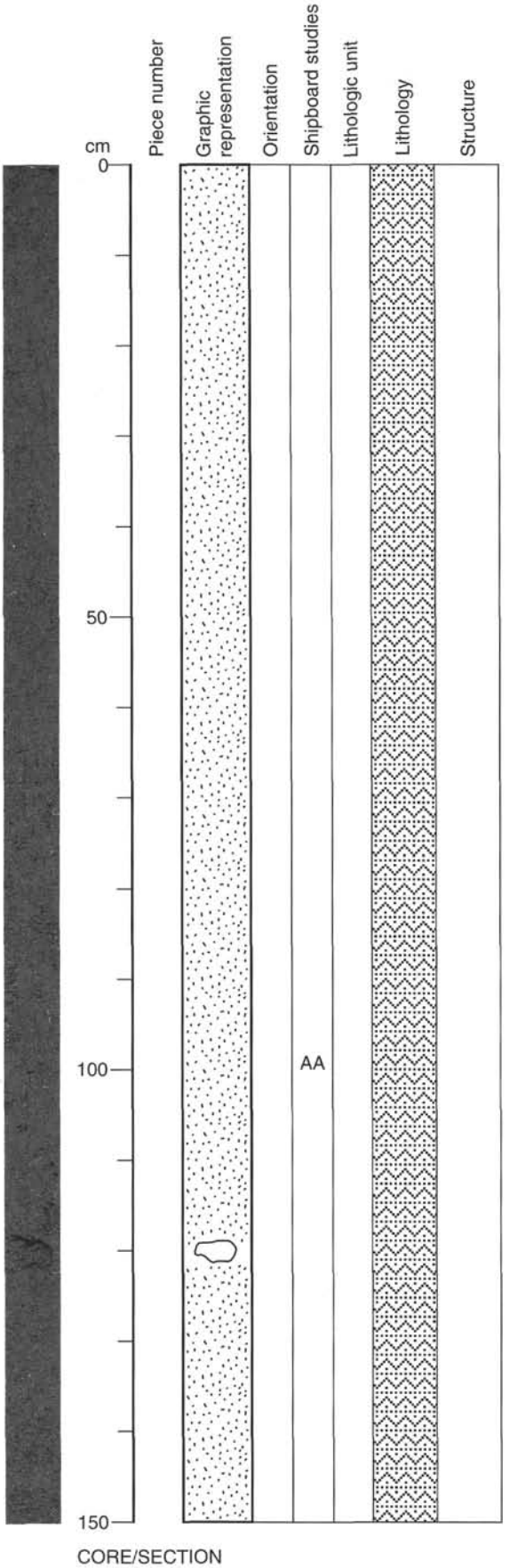
Pieces 0–150 cm

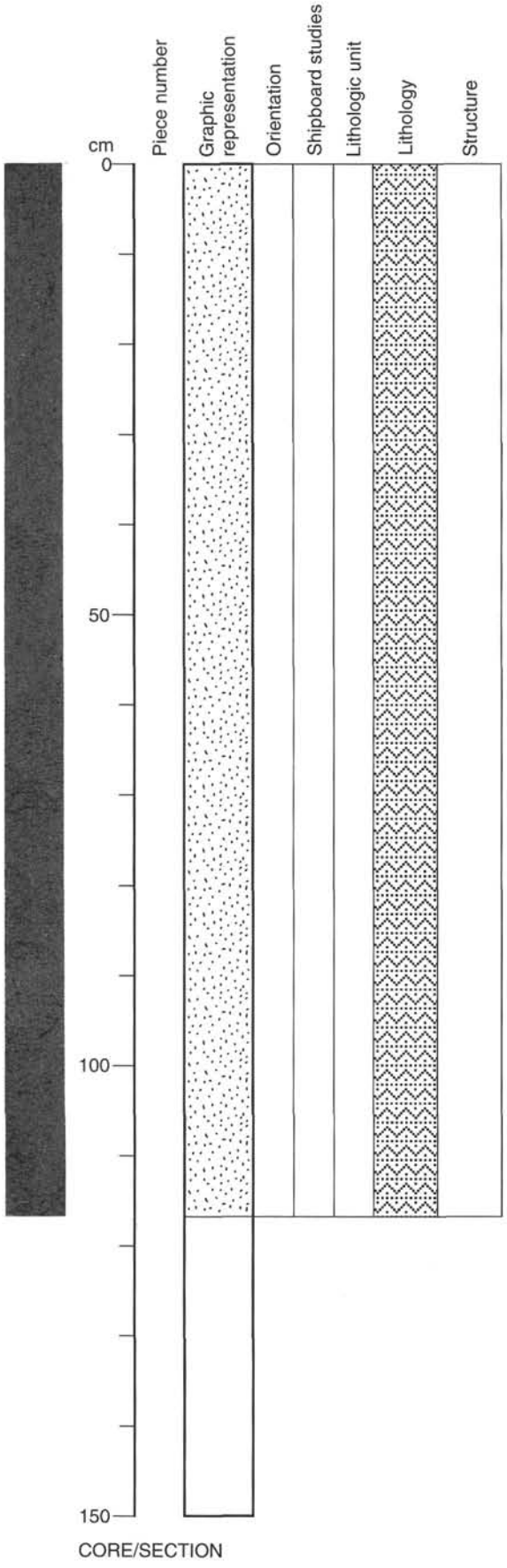
ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brassy yellow and red.
TEXTURAL DESCRIPTION: Section consists of pyrite and red chert drill cuttings with partially silicified Fe-oxides. This section is somewhat coarser grained than the sand in Section 158-957Q-1R-1. Grain size increases downsection, but this is most likely circulation induced.

158-957Q-1R-3

Pieces 0–150 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brassy yellow and red.
TEXTURAL DESCRIPTION: Section consists of pyrite and red chert drill cuttings with partially silicified Fe-oxides. This section is somewhat coarser grained than the sand in Sections 158-957Q-1R-1 and -2R-1. Grain size increases downsection, but this is most likely circulation induced.
ADDITIONAL COMMENTS: At 120 cm, a 5-cm fragment of porous red chert with disseminated euhedral pyrite is embedded in the sand. Pyrite aggregates occur in open space. Euhedral fine-grained sphalerite lines a 1-cm-long vug.



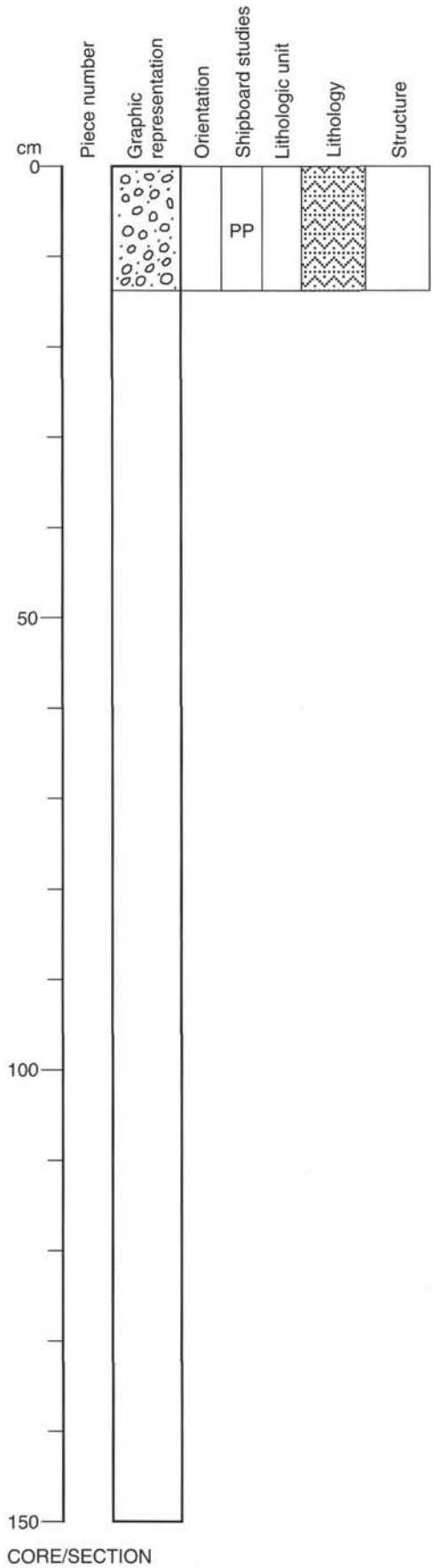


158-957Q-1R-4

Pieces 0–117 cm

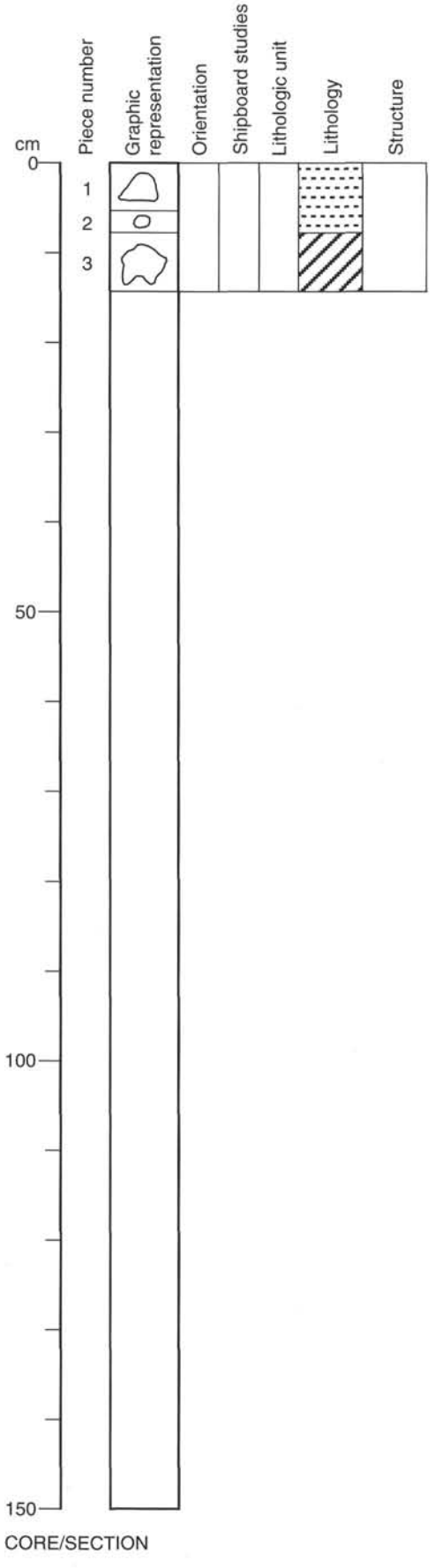
ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brassy yellow and red.
TEXTURAL DESCRIPTION: Section consists of pyrite and red chert drill cuttings with partially silicified Fe-oxides. This section is somewhat coarser grained than the sand in Sections 158-957Q-1R-1 through 1R-3. Grain size increases downsection, but this is most likely circulation induced. The section contains some pebble-sized fragments.

158-957Q-1R-CC



Pieces 0–14 cm

ROCK TYPE: DRILL CUTTINGS
CONTACTS: None.
COLOR: Brassy yellow and red.
TEXTURAL DESCRIPTION: This is material removed from the Core Catcher. It consists of friable, pebble-sized fragments of porous red chert, with encrustations of pyrite and some Fe-oxides.



158-957Q-2R-1

Pieces 1–2

ROCK TYPE: RED AND GRAY CHERT (Types 2 and 3).
CONTACTS: None.
COLOR: Red and gray.
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Silica, 80%–95%, fine-grained, massive silica matrix.
Fe-oxides, trace–20%, very fine-grained staining in chert.
MINOR MINERALS:
Name, Abundance (%), Size, Included in, Characteristics
Pyrite, trace to 5%, fine- to medium-grained, disseminated in gray chert and rimming gray chert clast.
TEXTURAL DESCRIPTION: Red chert and gray chert with gradational boundaries.
ADDITIONAL COMMENTS: Piece 1 is red chert intergrown with gray chert. Piece 2 is gray chert with only traces of Fe-oxides. Euhedral pyrite is rimming the gray chert clast in Piece 2.

Piece 3

ROCK TYPE: MASSIVE POROUS PYRITE (Type 5a).
CONTACTS: None.
COLOR: Brassy yellow gray
MAJOR MINERALS:
Name, Abundance (%), Size, Morphology, Characteristics
Pyrite, 60%, fine- to coarse-grained, matrix to pyrite-silica clasts, and disseminated in clasts.
Quartz, 40%, matrix in pyrite-silica clasts.
TRACE MINERALS (<2%):
Name, Size, Included in, Characteristics
Chalcopyrite, fine-grained, disseminated in pyrite.
Fe-oxides, very fine-grained, red chert clast.
TEXTURAL DESCRIPTION: Pyrite-silica clasts in a matrix of porous massive pyrite.
ADDITIONAL COMMENTS: Single angular red chert clast (5 mm) in the massive pyrite.