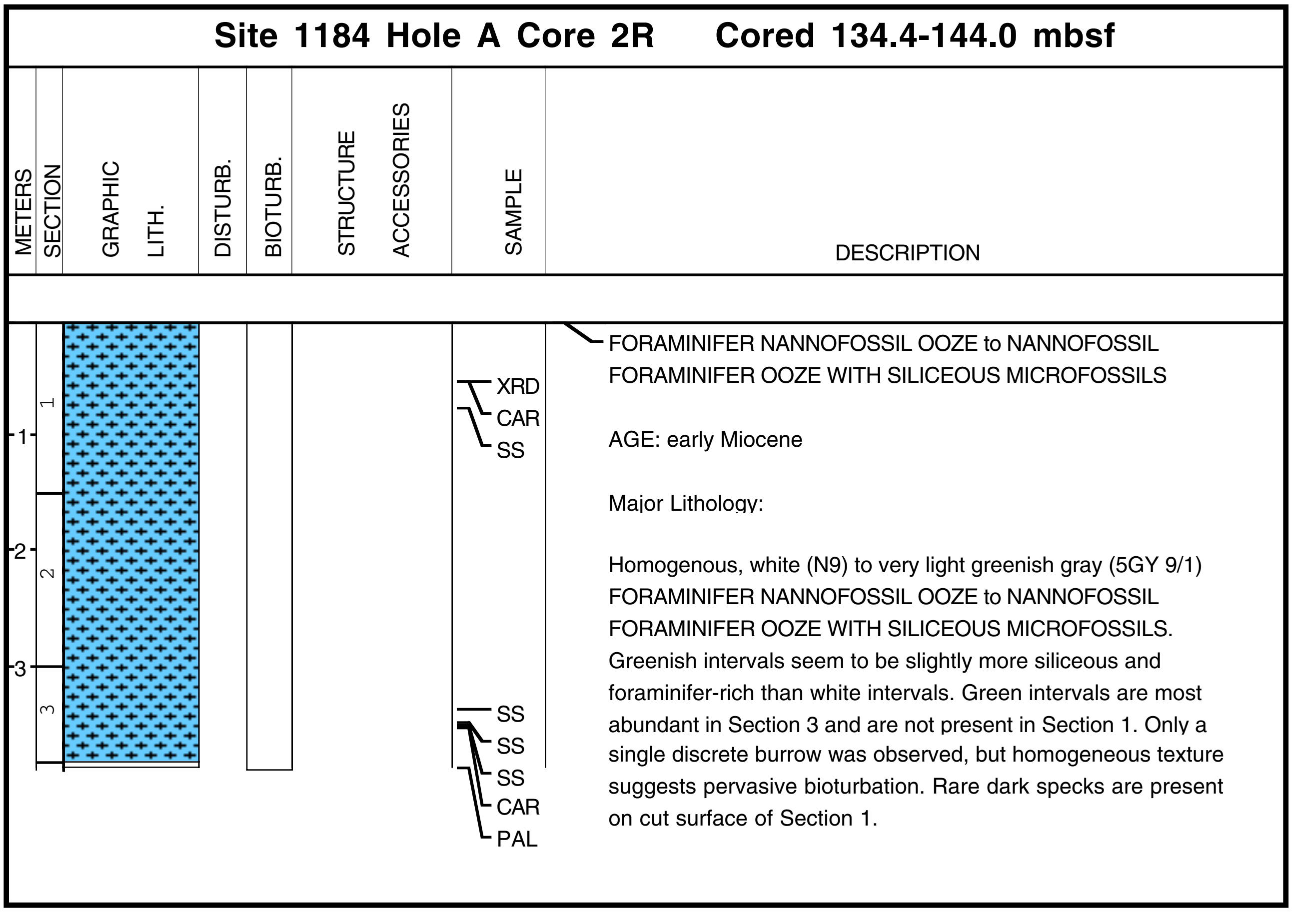
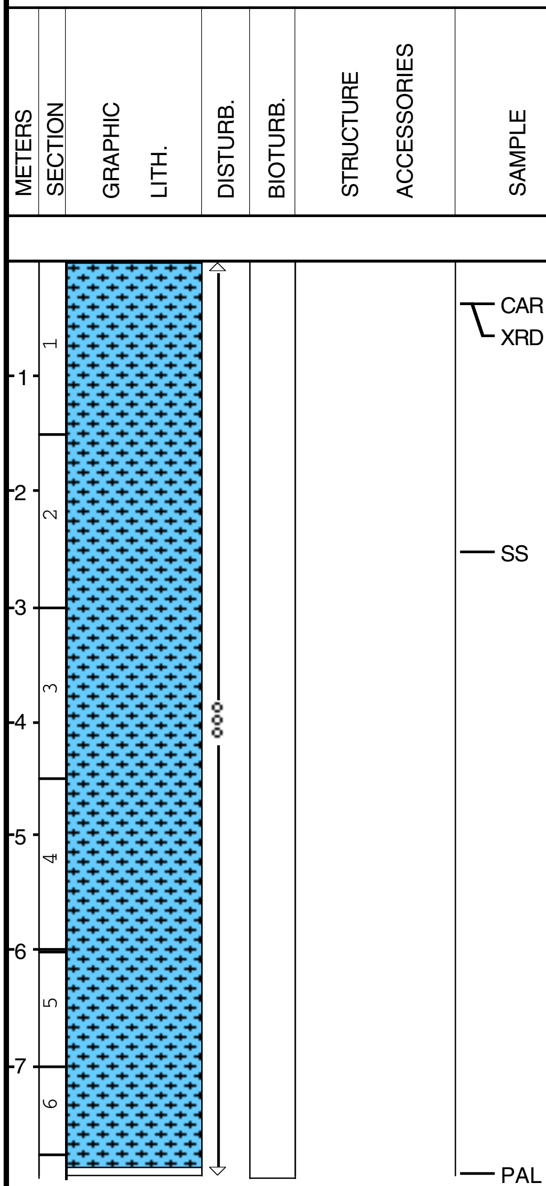
Core Photo

1184A-1W WASH CORE



Core Photo

Site 1184 Hole A Core 3R Cored 144.0-153.7 mbsf



DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE

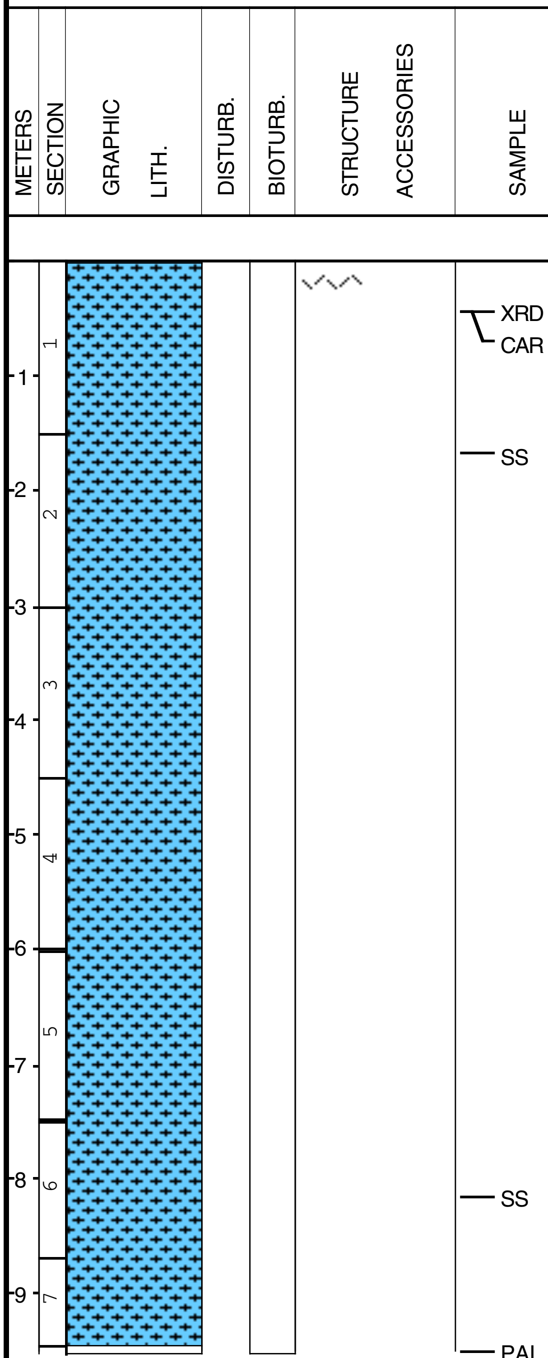
AGE: early Miocene

Major Lithology:

FORAMINIFER NANNOFOSSIL OOZE is white (N9) and homogenous. No discrete structures are present, but texture suggests pervasive bioturbation. The sediment contains ≤10% siliceous microfossils.

Core Photo

Site 1184 Hole A Core 4R Cored 153.7-163.3 mbsf



DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE

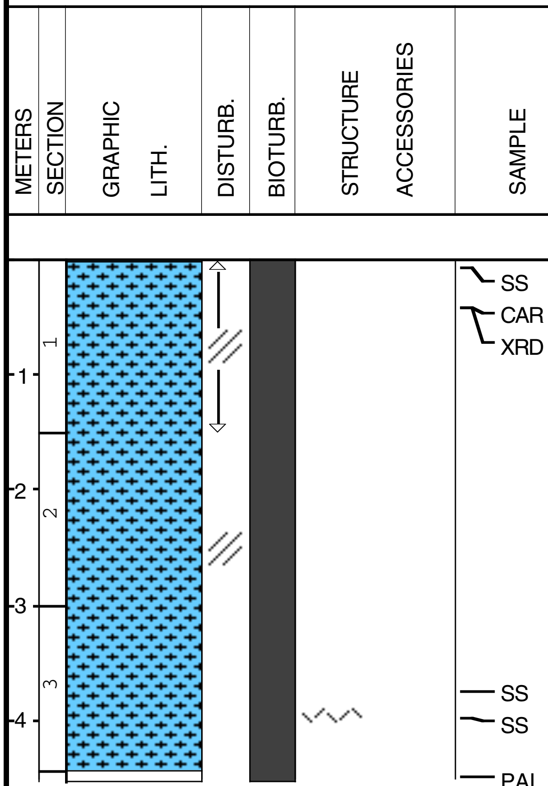
AGE: early Miocene

Major Lithology:

FORAMINIFER NANNOFOSSIL OOZE is white (N9) and homogenous. No discrete structures are present, but texture suggests pervasive bioturbation. The sediment contains 5-10% siliceous microfossils. In Sections 6 and 7, there is a subtle greenish color. A single 1-mm-thick diffuse dark layer in Section 1 at 16 cm contains rare glass shards.

Core Photo

Site 1184 Hole A Core 5R Cored 163.3-172.9 mbsf



DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE

AGE: early Miocene

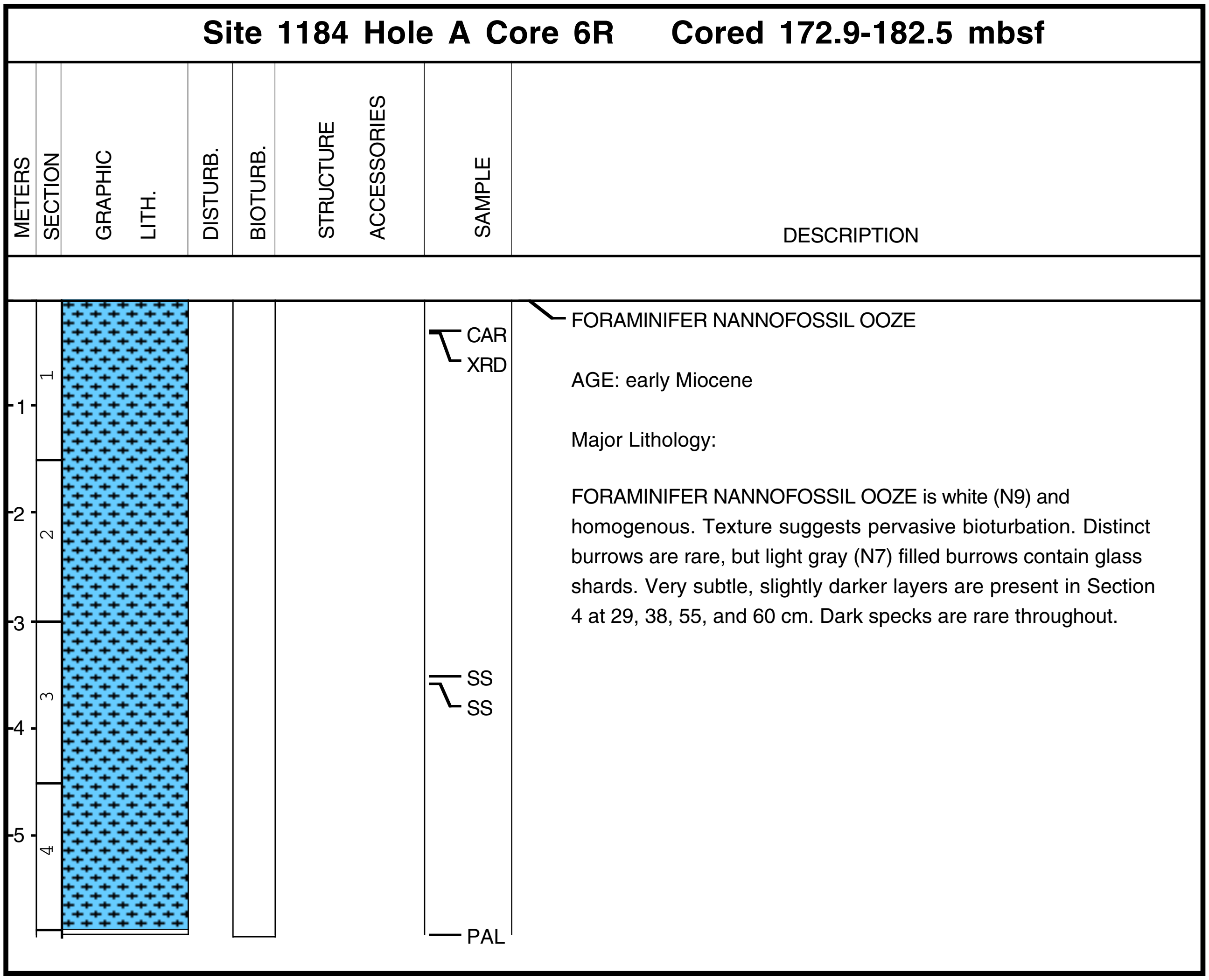
Major Lithology:

FORAMINIFER NANNOFOSSIL OOZE is white (N9) and homogenous. Burrows are rare. Very light gray intervals in Section 2, 128-135 cm, and Section 3, 58-70 cm, show faint lighter colored mottles. Rare sand-filled burrows are present at Section 1, 2-7 cm, 97 cm, and 122-142 cm; Section 2, 5-69 cm, 119 cm; and Section 3, 45-50 cm. Texture suggests pervasive bioturbation. Dark specks are present in the lowermost 15 cm of Section 3. The sediment contains 5-10% siliceous microfossils.

Minor Lithology:

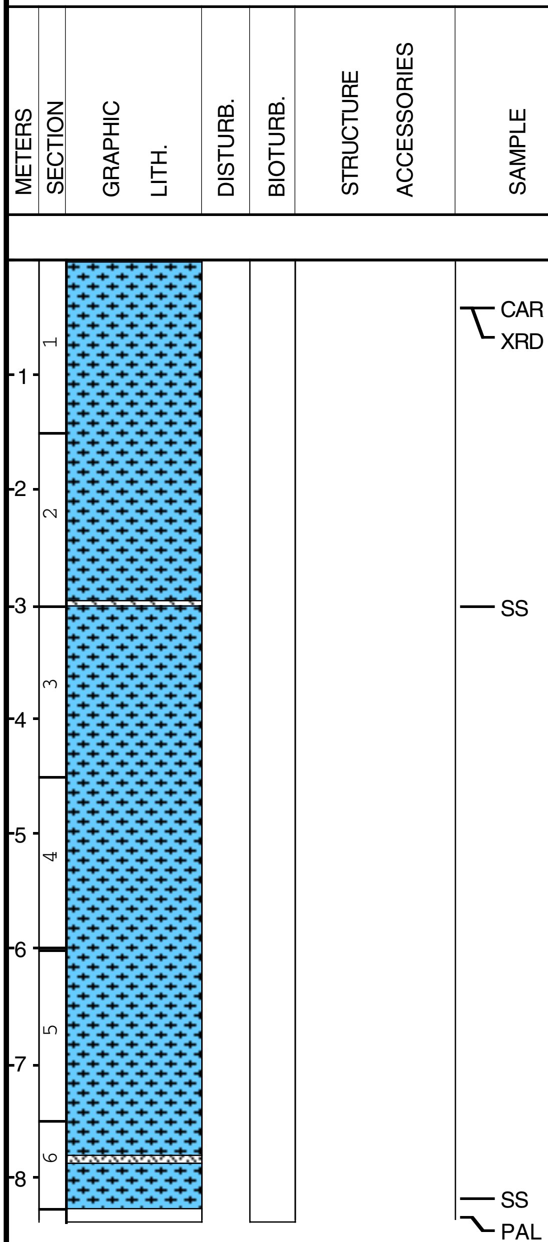
FORAMINIFER NANNOFOSSIL OOZE with rare glass shards in Section 3 from 93-97 cm is probably a bioturbated ash layer. Other ash layers are only preserved in burrows.

Core Photo


Site 1184 Hole A Core 6R Cored 172.9-182.5 mbsf
METERS
SECTION
GRAPHIC LITH.
DISTURB.
BIOTURB.
STRUCTURE
ACCESSORIES
SAMPLE
DESCRIPTION
1
2
3
4
5
CAR
XRD
SS
SS
PAL
FORAMINIFER NANNOFOSSIL OOZE
AGE: early Miocene
Major Lithology:
FORAMINIFER NANNOFOSSIL OOZE is white (N9) and homogenous. Texture suggests pervasive bioturbation. Distinct burrows are rare, but light gray (N7) filled burrows contain glass shards. Very subtle, slightly darker layers are present in Section 4 at 29, 38, 55, and 60 cm. Dark specks are rare throughout.

Core Photo

Site 1184 Hole A Core 7R Cored 182.5-191.8 mbsf



DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE

AGE: early Miocene

Major Lithology:

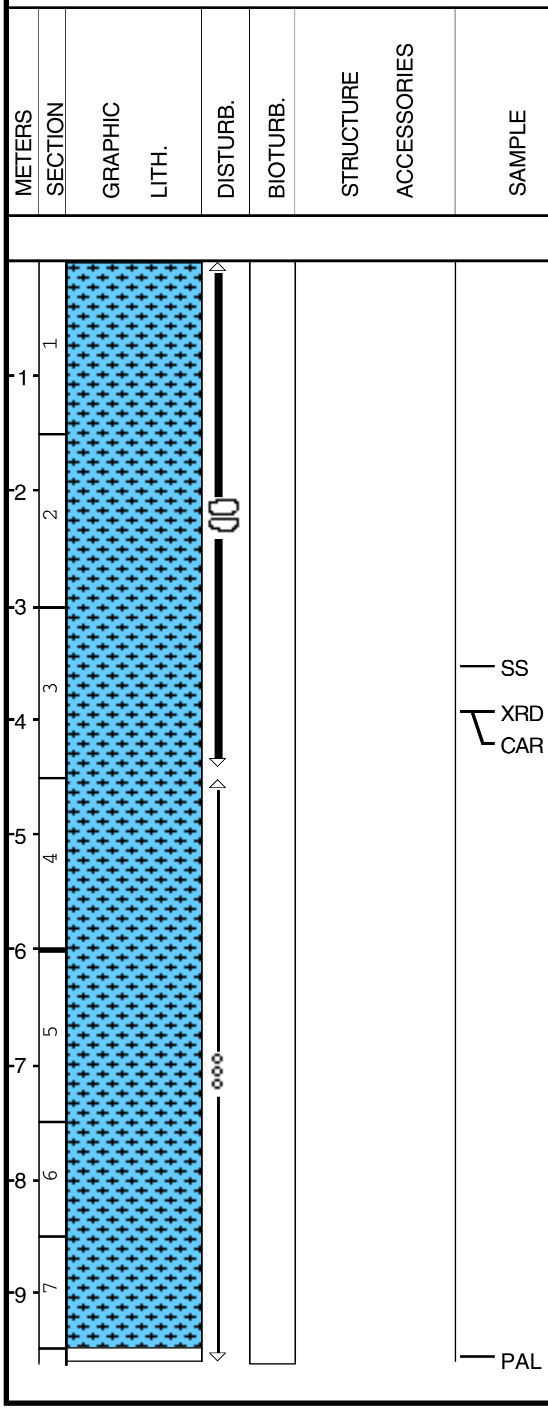
FORAMINIFER NANNOFOSSIL OOZE is white (N9) and homogenous. Discrete burrows are rare and are filled with light gray (N7) sediment. Very subtle, slightly darker layers are present in at the bottom of Section 3. Rare dark specks are common throughout. Texture suggests pervasive bioturbation.

Minor Lithology:

VITRIC ASH is present in Section 2, 145-150 cm and Section 6, 31-37 cm. Glass shards are coarse silt to fine sand. Ash is mixed by bioturbation into surrounding sediment. Light green interval in Section 2, 95-100 cm is possibly a highly mixed ash layer. Additional ash layers are suggested by the color of burrows in Section 1, 22 cm and Section 2, 70 cm.

Core Photo

Site 1184 Hole A Core 8R Cored 191.8-201.1 mbsf



DESCRIPTION

FORAMINIFER NANNOFOSSIL OOZE to CHALK

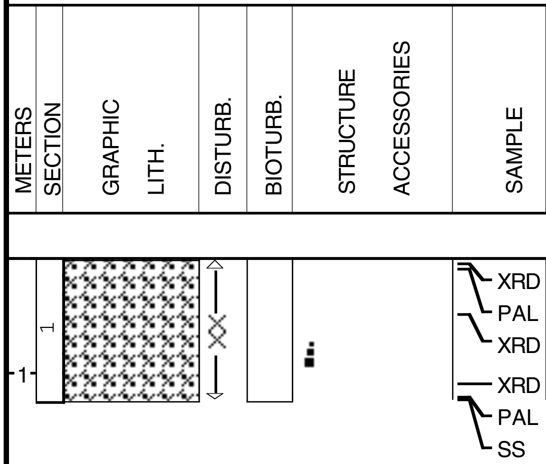
AGE: early Miocene

Major Lithologies:

FORAMINIFER NANNOFOSSIL OOZE is white (N9) and locally lithified to CHALK. The core is broken into stiff biscuits surrounded by drilling slurry. No burrows or other sedimentary textures are observed. Scattered 1-mm black specks are present throughout.

Core Photo

Site 1184 Hole A Core 9R Cored 201.1-202.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

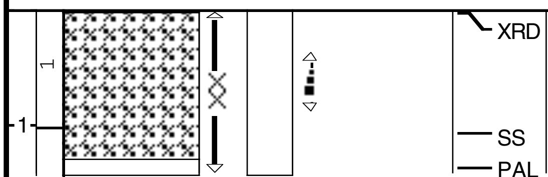
Major Lithology:
LITHIC VITRIC TUFF, very pale brown (10YR 7/4) to red (2.5YR 4/6), composed of poorly sorted coarse ash with subrounded to subangular grains. The main components are black, altered glass shards and altered lithic fragments with scattered accretionary lapilli, some broken. Massive to faintly bedded, with a normally graded sequence from 80-103 cm.

Minor Lithology:
A black MANGANESE CRUST (Section 1, 0-1 cm) is present at the top of the LITHIC VITRIC TUFF.

Core Photo

Site 1184 Hole A Core 10R Cored 202.9-206.4 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC VITRIC TUFF

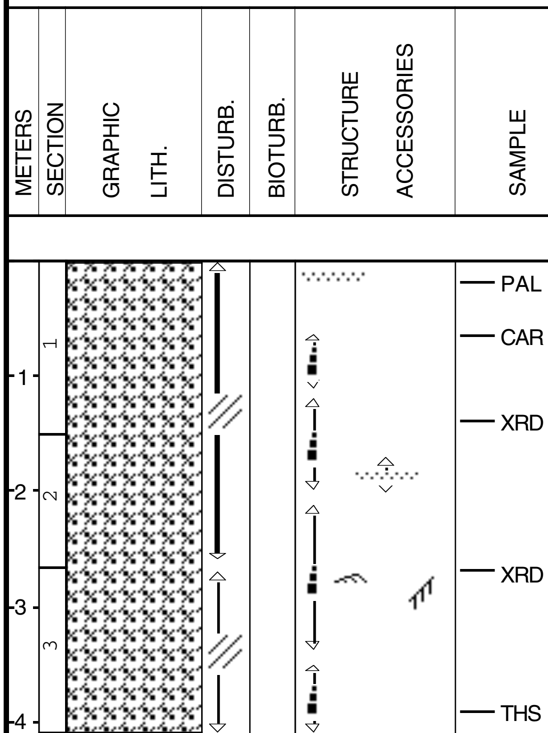
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF, very pale brown (10YR 7/4) to red (2.5YR 4/6), composed of poorly sorted, coarse ash with rare lapilli. The main components are black, altered glass shards and altered lithic fragments. Massive to faintly bedded, with a normally graded sequence from 33-88 cm.

Core Photo

Site 1184 Hole A Core 11R Cored 206.4-210.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

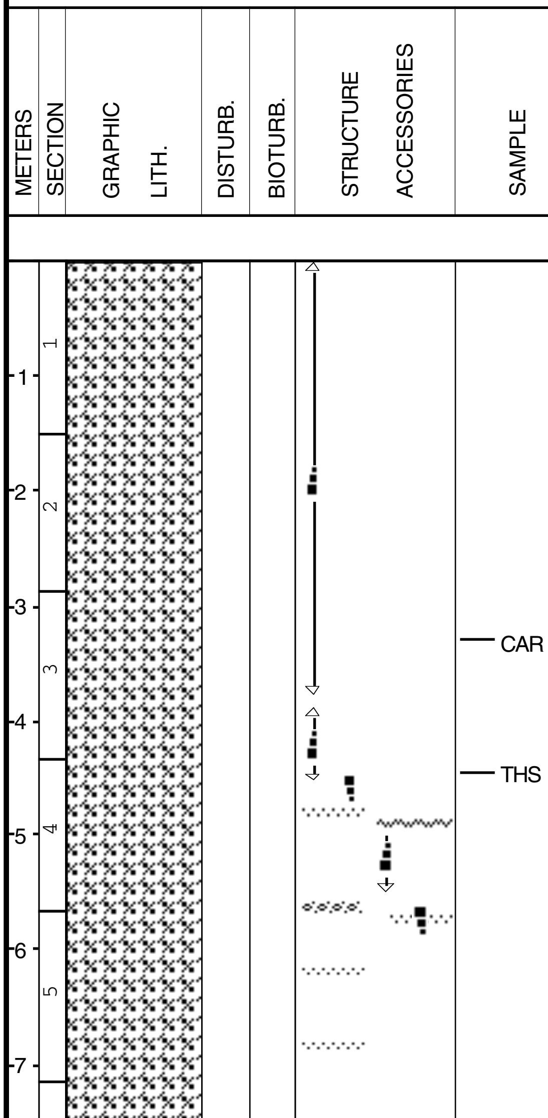
AGE: middle to late Eocene

Major Lithology:

LITHIC VITRIC TUFF, very pale brown (10YR 7/4) to red (2.5YR 4/8) in Sections 1 and 2, and light greenish gray (5G 7/1) in Section 3, with a color change along an inclined vein in Section 3, 4-9 cm. The TUFF is poorly sorted, with grain sizes ranging from very coarse to very fine sand. Grains vary from subrounded to subangular. Massive, but weak bedding seen in some intervals. Accretionary lapilli, ≤8 mm in diameter, are abundant in some intervals (e.g., Section 2, 23-43 cm.).

Core Photo

Site 1184 Hole A Core 12R Cored 210.9-220.4 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

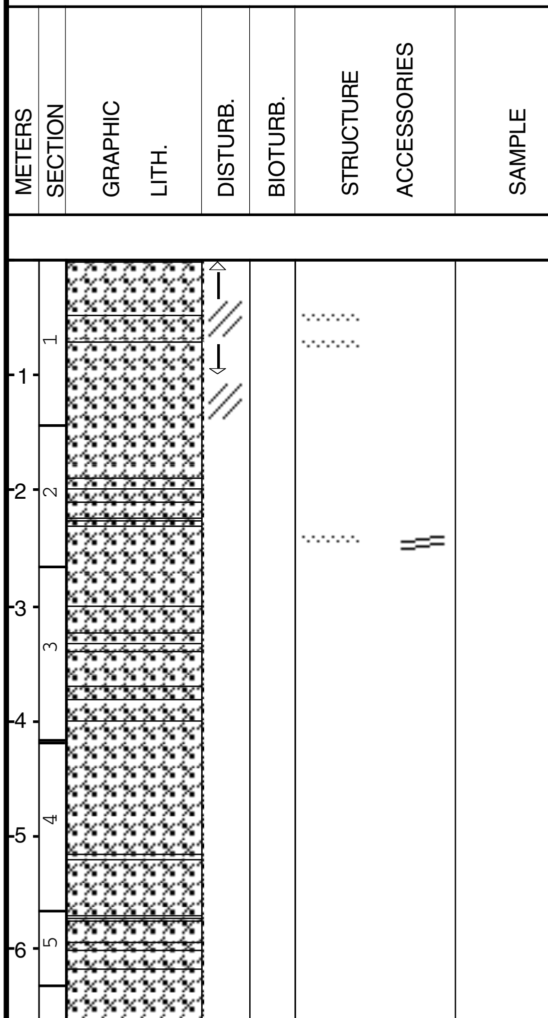
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF, dark greenish gray (5G 4/1), with a reddish-yellow (7.5Y 6/8) interval in Section 4 at 6-75 cm bordered by 10-cm-thick transitions of pale green (5G 7/2). The TUFF is poorly sorted with a grain size of very coarse sand and has normally graded intervals within individual beds. A single normally graded bed spans at least 4 meters from Section 3, 90 cm through the top of this core and into the lower portion of Core 11R. Alternating coarser- and finer-grained intervals are present below Section 3, 90 cm. Accretionary lapilli are concentrated in Section 4 (105-110 cm) and Section 5 (52-55 cm and 95-115 cm). A winnowed interval of coarse ash is present in Section 5, 115-116 cm

Core Photo

Site 1184 Hole A Core 13R Cored 220.4-230.0 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

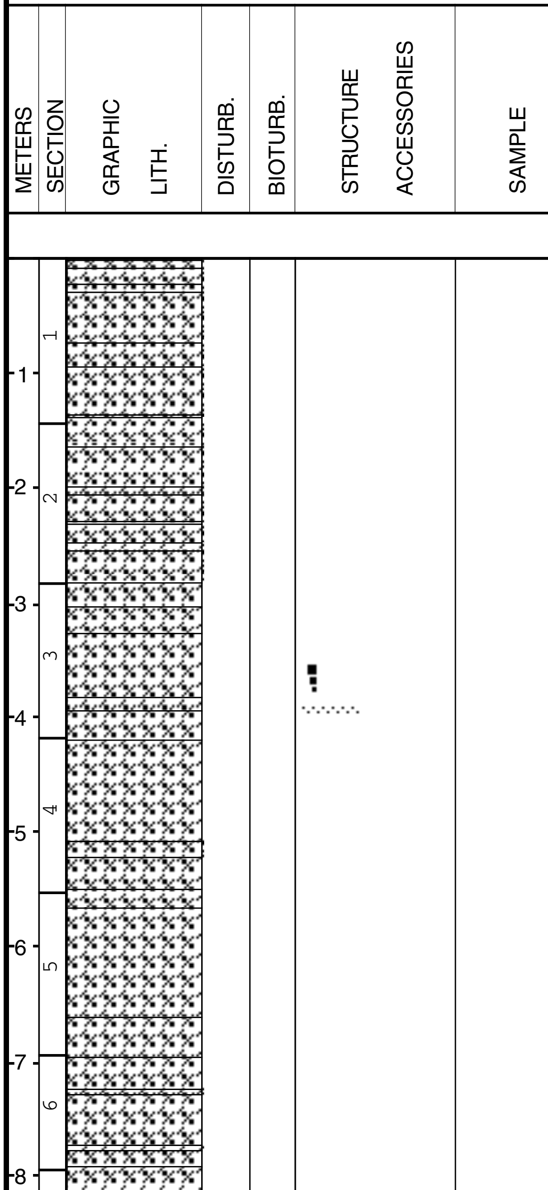
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF, massive, poorly sorted, with a range of grain sizes from fine sand to pebble. Grains are angular and include altered basaltic glass and lithics. The core contains subhorizontal and highly inclined white calcite-zeolite veins. Accretionary lapilli are generally rare, but are common in Section 1, 73-100 cm. The TUFF is thin bedded to massive. In massive intervals, a faint layering is imparted by subhorizontal alignment of the long dimensions of grains.

Core Photo

Site 1184 Hole A Core 14R Cored 230.0-239.6 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

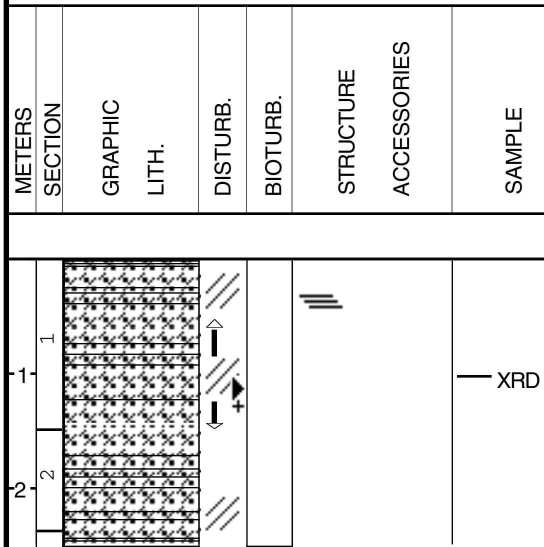
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF, poorly sorted, thin bedded to massive, olive gray to light olive (5Y 9/1 - 5Y 6/1). Grain size varies from medium to fine sand. Major components include altered basalt fragments and accretionary lapilli. A faint layering is imparted by subhorizontal alignment of the long dimensions of grains. The core contains subhorizontal and highly inclined white calcite-zeolite veins. Accretionary lapilli and broken accretionary lapilli are present throughout the core and are common in Section 1, 30-50 cm; Section 4, 30-105 cm; and Section 5, 75-95 cm. A reddish stain is seen in Section 6, 55-70 cm.

Core Photo

Site 1184 Hole A Core 15R Cored 239.6-244.4 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

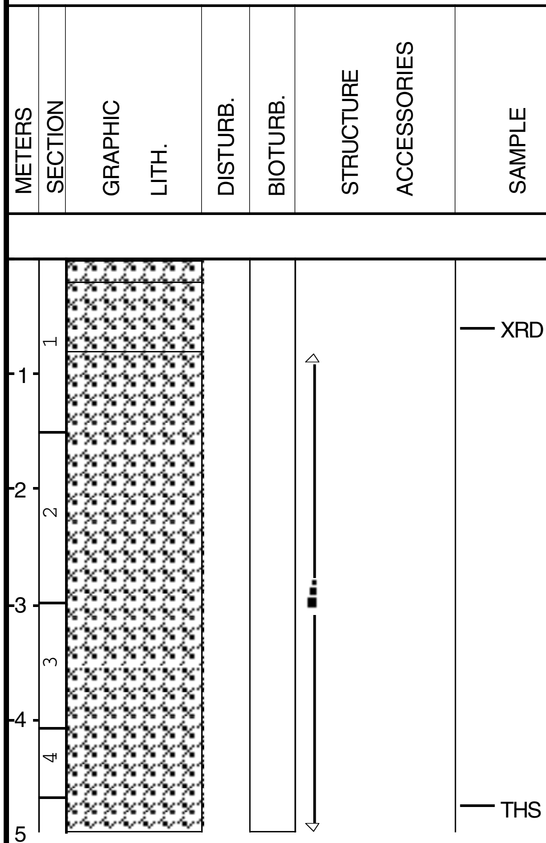
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF, poorly sorted, greenish gray (5G 6/1) to light gray (N7), except Section 1, 38-124 cm, which is reddish brown to dark reddish brown (2.5YR 4/4 to 2.5YR 3/4). Grain size varies from medium to fine sand. Major components include altered basalt fragments, accretionary lapilli and red grains. The red grains are most common in the reddish interval but are also found in greenish gray intervals. The TUFF ranges from matrix to grain supported and massive to thinly bedded. Accretionary lapilli are present throughout the core.

Core Photo

Site 1184 Hole A Core 16R Cored 244.4-249.2 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

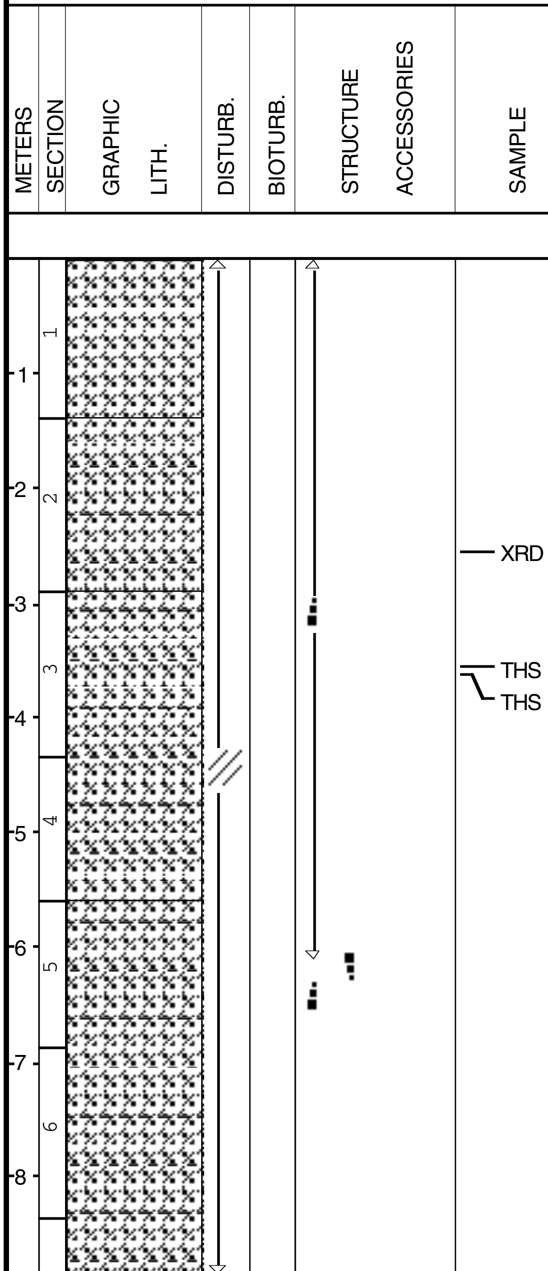
Major Lithology:

LITHIC VITRIC TUFF, greenish gray (5G 6/1), with a reddish brown (5YR 4/4) interval in Section 1, 19-80 cm. In Section 1, 0-80 cm, the TUFF is thin bedded, grain supported, and poorly sorted, with grain sizes ranging from fine to coarse sand. Accretionary lapilli are present in Section 1 at 60 cm. From Section 1, 80 cm through Section CC, 28 cm, the core contains a single normally graded bed. Within this interval, the TUFF is poorly sorted and massive, but elongate grains tend to be aligned subhorizontally. Maximum grain size varies from coarse sand in Section 1 to granule to small pebble in Sections 4 and CC. A pale green vein spans Section 2, 20-75 cm.

The LITHIC VITRIC TUFF from Section 1, 80 cm through Section CC, 28 cm, is composed of 60% altered glass shards and 40% lithic fragments. The glass grains are dark, rounded to subrounded, ≤1 cm across and commonly contain a zeolitic core. Lithic fragments are light gray to pink, subangular, ≤1 cm across, and vesicular. About 10% of the lithic fragments are highly vesicular and lighter in color; about 5% of the lithic fragments are red to dusky red. Grains are cemented by zeolite.

Core Photo

Site 1184 Hole A Core 17R Cored 249.2-258.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

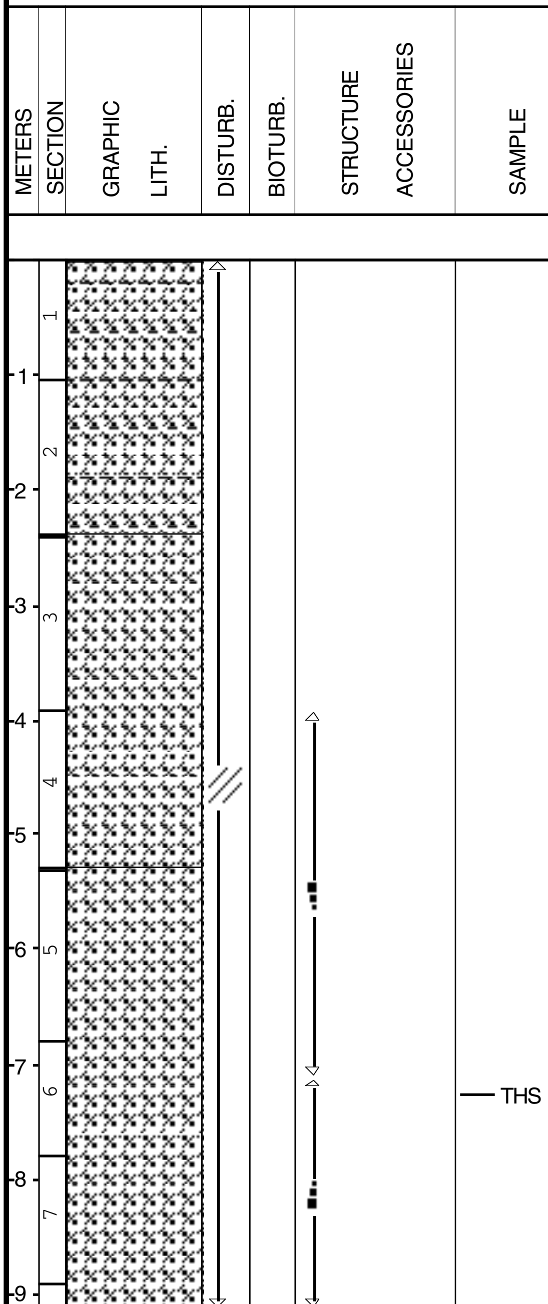
Major Lithology:

LITHIC VITRIC TUFF, greenish gray (5G 6/1), massive and very poorly sorted. Contains 10 to 15% pebble-sized angular lapilli. This core is part of a single very thick bed (approximately 25 meters thick) spanning Cores 18R, 17R and the lower part of 16R, with progressive changes in average grain size and proportion of granule- and pebble-sized lapilli. From Section 1, 0 cm, to Section 5, 50 cm the core is normally graded. From Section 5, 50 cm, to Section 7, 50 cm, there is a lower proportion of granule- and pebble-sized lapilli. A 3-cm-diameter, dark gray, lithic pebble is present at Section 3, 105 cm, and a pale green (5G 7/2) vein with a red (7.5R 4/8) halo spans Section 4, 45-65 cm.

The LITHIC VITRIC TUFF is composed of 45% lithic fragments (generally subangular and subequant), 35% altered glass shards, and 20% matrix (mostly altered glass particles). The lithic fragments include, in approximate order of decreasing abundance: pinkish-brown lapilli (nonvesicular to moderately vesicular), white pumiceous (highly vesicular) or granular lapilli, gray basaltic lapilli, and iron-oxide-stained lapilli. Accretionary lapilli are rare. One armored lapillus is seen in Section 2, 116 cm; it has 1-mm nucleus of altered black glass.

Core Photo

Site 1184 Hole A Core 18R Cored 258.9-268.5 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

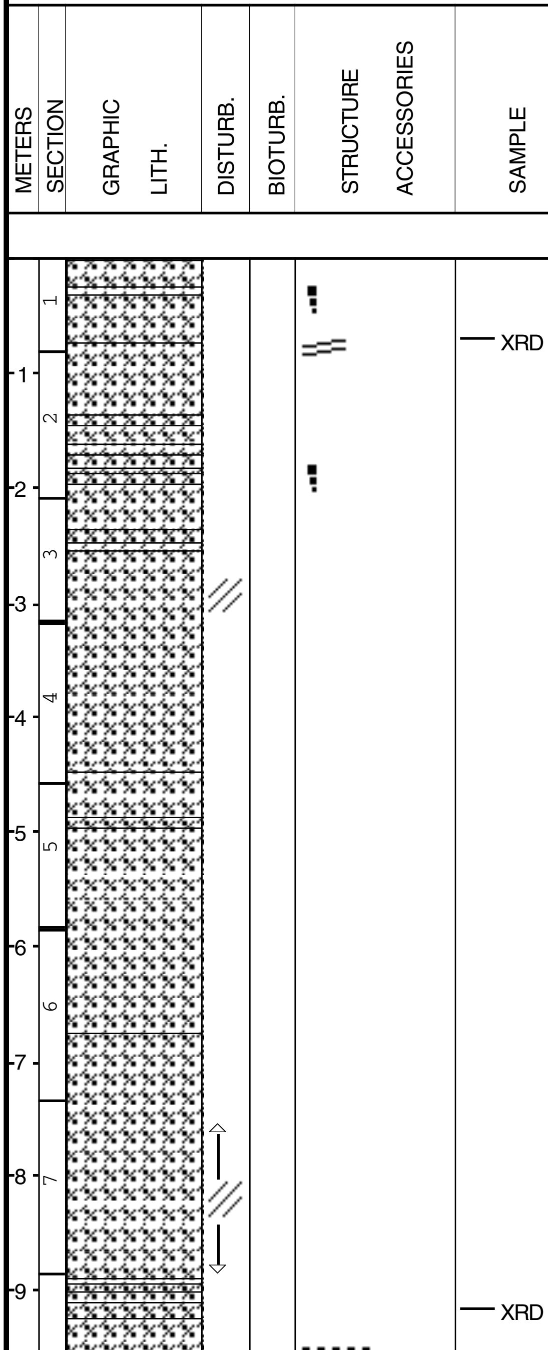
Major Lithology:

LITHIC VITRIC TUFF, greenish gray (5GY 6/1) to dark greenish gray (5Y 5/1), very poorly sorted, and consisting mostly of coarse ash and lapilli. This core is part of a single very thick bed (approximately 25 meters thick) spanning Cores 18R, 17R and the lower part of 16R, with progressive changes in average grain size and proportion of granule- and pebble-sized lapilli. In Sections 1 through 3 of this core and into the lower 2 meters of overlying Core 17R, the TUFF has relatively constant grain size. It is clast-supported with 20% granule- and pebble-sized angular lapilli. From Section 4, 0 cm, through Section 6, 30 cm, the TUFF is reversely graded with 5-10% granule-sized clasts. From Section 6, 30 cm, through Section CC, 22 cm the TUFF is normally graded with less than 5% granule-sized clasts. In Section 7 the TUFF contains thin beds with grain sizes alternating between fine and medium sand. Broken accretionary lapilli are abundant in the finer lithologies. Veins of zeolite are present in Section 3, 112-123 cm.

In Sections 1 through 5, the LITHIC VITRIC TUFF is composed of 40% lithic fragments (generally subangular and subequant, but showing a wide range of morphologies including jagged outlines), 30% altered glass shards and 30% matrix. The lithic fragments include, in approximate order of decreasing abundance: pinkish-gray lapilli (nonvesicular to moderately vesicular), black and gray basaltic lapilli, white pumiceous (highly vesicular) lapilli, and iron-oxide-stained lapilli. Accretionary lapilli are sparse in Section 1 and 2, absent in Sections 3 and 4, and abundant in Section 5. Many broken fragments of accretionary lapilli are present in Sections 5 to CC.

Core Photo

Site 1184 Hole A Core 19R Cored 268.5-278.1 mbsf



DESCRIPTION

LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF

AGE: middle Eocene

Major Lithologies:

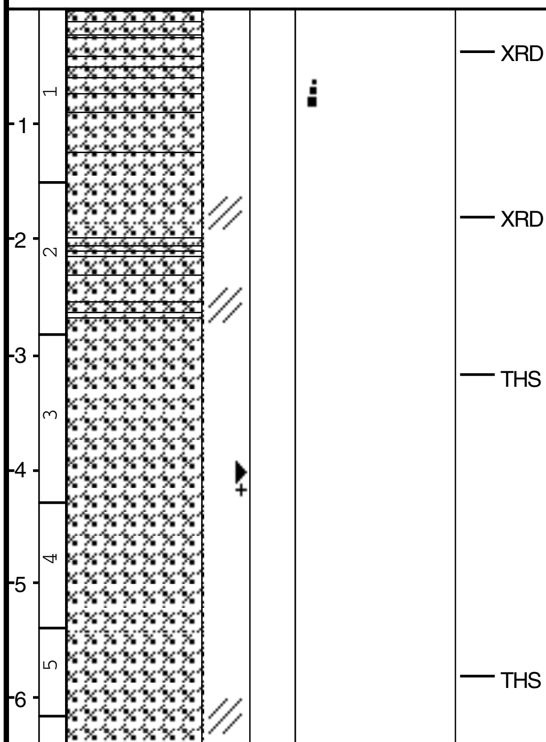
LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF, greenish gray (5GY 6/1) to dark gray (N4) and dark reddish brown (5YR 3/3). Reddish brown intervals are bedded; greenish gray intervals are either massive or very thin bedded. The core is generally poorly sorted; intervals with better-defined bedding are moderately sorted (Section 1, 75-79 cm, Section 7, 107-150 cm, and Section CC, 0-72 cm). The TUFF is mostly composed of coarse ash and lapilli, with large (≤2 cm) lapilli in Sections 3 through 7. Reversely graded beds, 10-cm thick, occur in Section 2, 55-130 cm. Alternating finer and coarser beds are present in Section 5, 0-65 cm and Section 7, 110-150 cm. Accretionary lapilli are present in Section 1, 0-70 cm (~1 cm) and in Section CC, 0-35 cm (2-4 mm).

The LITHIC VITRIC TUFF and LITHIC VITRIC LAPILLI TUFF are composed of 30% lithic fragments (generally subangular and subequant), 40% altered glass shards and 30% matrix. The lithic fragments include, in approximate order of decreasing abundance: pinkish-brown lapilli (nonvesicular to moderately vesicular), white pumiceous (highly vesicular) or granular lapilli, gray basaltic lapilli, and iron-oxide-stained lapilli.

Core Photo

Site 1184 Hole A Core 20R Cored 278.1-287.7 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF

AGE: middle Eocene

Major Lithologies:

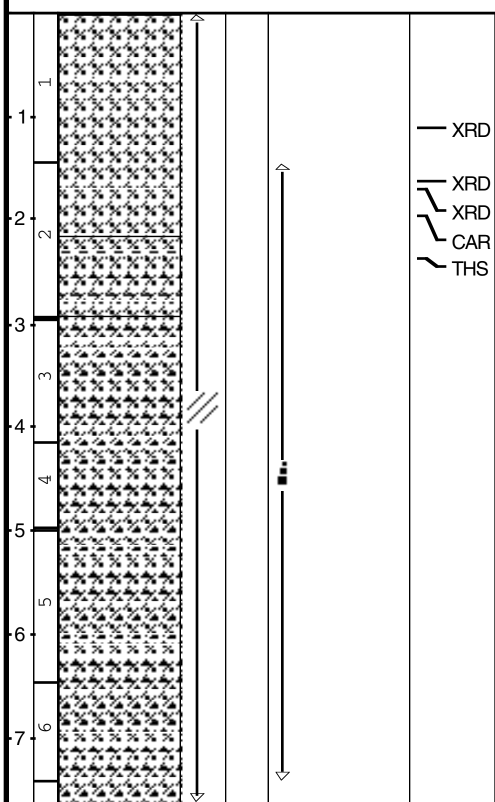
LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF, poorly sorted with angular to subangular lapilli, gray (N5) to very dark gray (N3), with a greenish gray (5GY 6/1) interval in Section 1, 0-14 cm and 40-142 cm. A single massive LAPILLI-TUFF bed is present in Sections 3 through CC, and a thinner LAPILLI-TUFF bed is present in Section 2, 0-50 cm. In Section 1, 0-150 cm and Section 2, 50-132 cm the TUFF is thin to medium bedded, with grain size ranging from medium to very coarse sand. Cement is dominantly zeolite, but also includes green clay in greenish intervals. White zeolitic veins are common in Sections 1 and 2, but rare in other parts of the core. Veins in Section 1 at 92 cm and in Section 2 at 18-40 cm have dark haloes. Tan lapilli are present throughout Section 2.

The LITHIC VITRIC TUFF and LAPILLI-TUFF are composed of 40% lithic fragments (generally subangular and subequant), 50% altered glass shards and 10% matrix. The lithic fragments include, in approximate order of decreasing abundance: nonvesicular to moderately vesicular pinkish-brown lapilli, white pumiceous (highly vesicular) lapilli, gray basaltic lapilli, iron-oxide-stained lapilli. Accretionary lapilli are sparse (1%).

Core Photo

Site 1184 Hole A Core 21R Cored 287.7-297.3 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF

AGE: middle Eocene

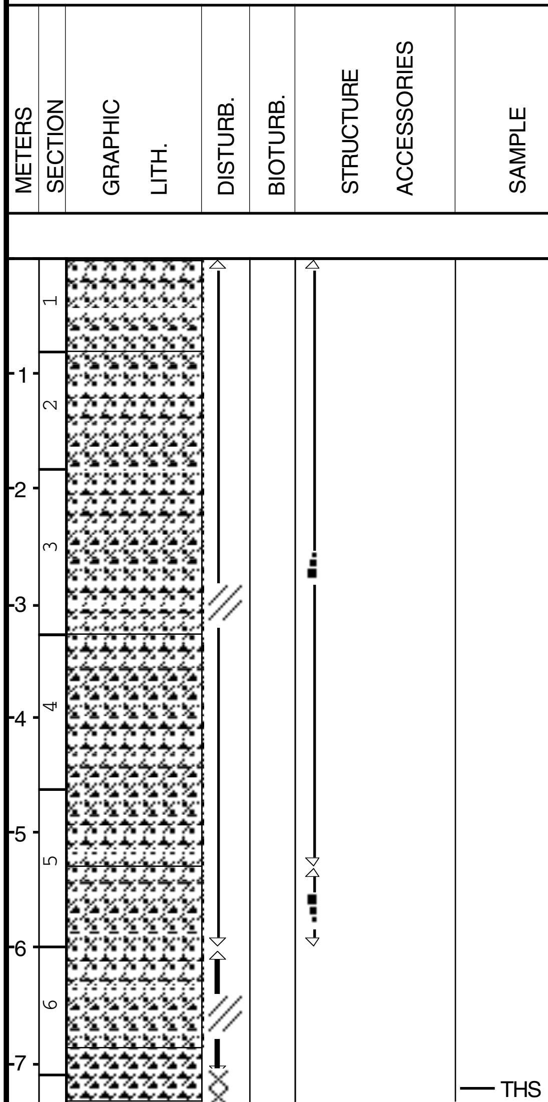
Major Lithologies:

Sections 1 and 2 are LITHIC VITRIC TUFF and the remainder of the core is LITHIC VITRIC LAPILLI-TUFF. The core is dominantly dark greenish gray (5G 4/1) to dark gray (N4), poorly sorted, and clast-supported. Lapilli are angular to subrounded, and ≤2 cm in diameter. Lapilli abundance and grain size decrease upward from 20% lapilli in a very coarse sand-sized matrix in Section CC to 10% lapilli in a medium sand-sized matrix in Section 2. Section 2, 40-90 cm is weak red (2.5YR 5/2). Veins filled with zeolite are common throughout the core. Intact accretionary lapilli (~1 cm diameter) are common to abundant in Section 3, 70 cm, through Section 5, 65 cm.

The LITHIC VITRIC TUFF in Section 1 and the upper part of Section 2 consists of 45% lithic fragments, 20% altered glass shards, and 35% matrix. The lithic fragments range in size from <1 mm to 11 mm and are typically elongate and subangular. Lithics consist mainly of pink lapilli, followed in order of decreasing abundance by basaltic lapilli, green lapilli, and white lapilli. Altered glass fragments range in size from <1 mm to 5 mm. They vary from equant to elongate, and are typically subrounded. They are all replaced at least in part by dark or white clay. From the bottom of Section 2 to Section CC, the LITHIC VITRIC LAPILLI-TUFF consists of 30% altered glass shards, 40% lithic fragments, and variable amounts of accretionary lapilli and matrix. The altered glass fragments range in size from <1 mm to 7 mm with the largest lapilli in Section 4. The altered glass fragments are mainly subangular and equant, but the smaller grains are angular and elongated. The lithic fragments range in size from <1 mm to 26 mm, with the largest pieces in Sections 5 and 6. Some of the larger lapilli are fragments of TUFF. The lithic fragments are angular to subrounded, and mainly equant. The larger pieces in Sections 5 and 6, however, are elongate. The majority of the lithic fragments are pinkish-brown, microcrystalline and nonvesicular to slightly vesicular. The largest clast in Section 5 is plagioclase-rich; it consists mainly of slender laths of twinned plagioclase, clinopyroxene(?) and dark-colored clay. Another elongate fragment has variolitic texture. Accretionary lapilli and subordinate amounts of armored lapilli are present from Section 2 to CC. They range in abundance from ~5% at the bottom of Section 2 and ~2% in Section CC to a maximum of 20% in Section 4 and the top of Section 5. They range in size from 3 to 13 mm. The largest accretionary lapilli are found in Section 4 and the top of Section 5. The accretionary lapilli in Sections 3, 6 and CC are commonly broken. The few armored lapilli have large plagioclase crystals and altered glass nuclei.

Core Photo

Site 1184 Hole A Core 22R Cored 297.3-306.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF, LITHIC VITRIC LAPILLI-TUFF, and LITHIC LAPILLISTONE

AGE: middle Eocene

Major Lithologies:

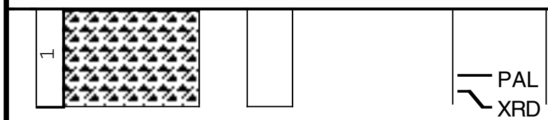
From Section 1 through Section 6, 90 cm, the core consists of LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF, dark greenish gray (5G 4/1), with 15-20% granule- to pebble-sized lithic fragments. Texture is very coarse-grained, massive, and poorly sorted. The average grain size and abundance of granule-sized lapilli coarsens gradually upward from Section 5, 75 cm, through the top of Section 1. The core is normally graded in Section 5 from 75-135. A 3-cm-diameter angular clast occurs in Section 1 at 25 cm, and two large rip-up clasts, 3- and 5-cm, in Section 3 at 33 and 40 cm, respectively. The TUFF and LAPILLI-TUFF consist of 35% altered glass shards, 40% lithic lapilli and 25% matrix. The amount of altered glass fragments increases whereas that of lithic lapilli decreases downward to the bottom of Section 5. The bottom of Section 5 and the top of Section 6 show banding and better sorting of altered glass fragments. Altered glass fragments range from 1 to 12 mm in size, and are mainly subangular and elongate. Some altered glass fragments are vesicular. Lithic lapilli range from 1 mm to 5 cm, with the larger lapilli dominant in Section 3, and are angular to subangular and equant to elongate. Lapilli in the LITHIC VITRIC TUFF include microcystalline rock fragments with altered glassy rims and/or Fe-oxyhydroxide stains, and plagioclase-rich rock fragments. A few (<1%), rounded, equant, 3- to 7-mm accretionary lapilli and lesser amounts of armored lapilli occur in the TUFF. Carbonised wood fragments, ~2 cm long, are found in Section 2 at 73 cm, and in Section 6 at 65 cm on surfaces between pieces of core in the working half.

From Section 6, 90 cm, through Section CC, the rock is LAPILLISTONE, gray (N5/1), clast-supported, with rounded 2- to 5-mm lapilli. The LAPILLISTONE consists mainly (~95%) of rounded to subrounded, elongate lithic lapilli with minor (<1%) altered glass shards. The lapilli have interlocking contacts and show a subtle subhorizontal orientation, consistent with compaction. The lapilli are dark brown to various shades of gray, range in size from <1 to 16 mm, are nonvesicular, and are cemented with white zeolite and minor carbonate.

Core Photo

Site 1184 Hole A Core 23R Cored 306.9-316.6 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC LAPILLISTONE

AGE: middle Eocene

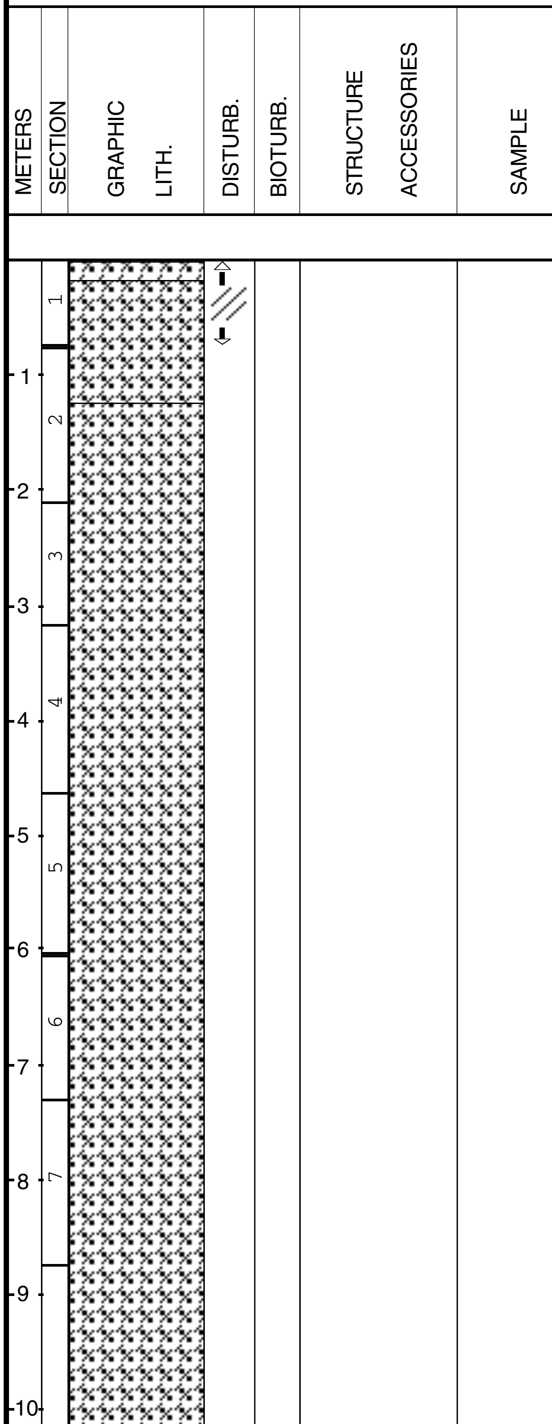
Major Lithology:

LITHIC LAPILLISTONE has granule- to small-pebble-sized lapilli, is moderately sorted, and is dark greenish gray (5G 4/1) in Section 1, 0-9 cm, changing to brownish yellow (10YR 6/6) in Section 1, 9-82 cm. Horizontal calcite veins occur in Section 1 at 59-61 cm. This LAPILLISTONE is a downward continuation of the lower part of Core 22R.

The LAPILLISTONE consists mainly (~80%) of yellow to brown lithic lapilli, with less abundant (~15%) gray lithic lapilli. The lithic fragments are mainly subrounded, equant and range in size from ~1 to 13 mm, with an average of ~3 mm. The lapilli have interlocking contacts and show a subtle subhorizontal orientation, consistent with compaction. Some of the lapilli are vesicular. Fine-grained ash matrix is present but very hard to distinguish from lapilli. Cement consists of white zeolite and minor carbonate.

Core Photo

Site 1184 Hole A Core 24R Cored 316.6-326.2 mbsf



DESCRIPTION

VITRIC LITHIC TUFF and VITRIC LITHIC LAPILLI-TUFF

AGE: middle Eocene

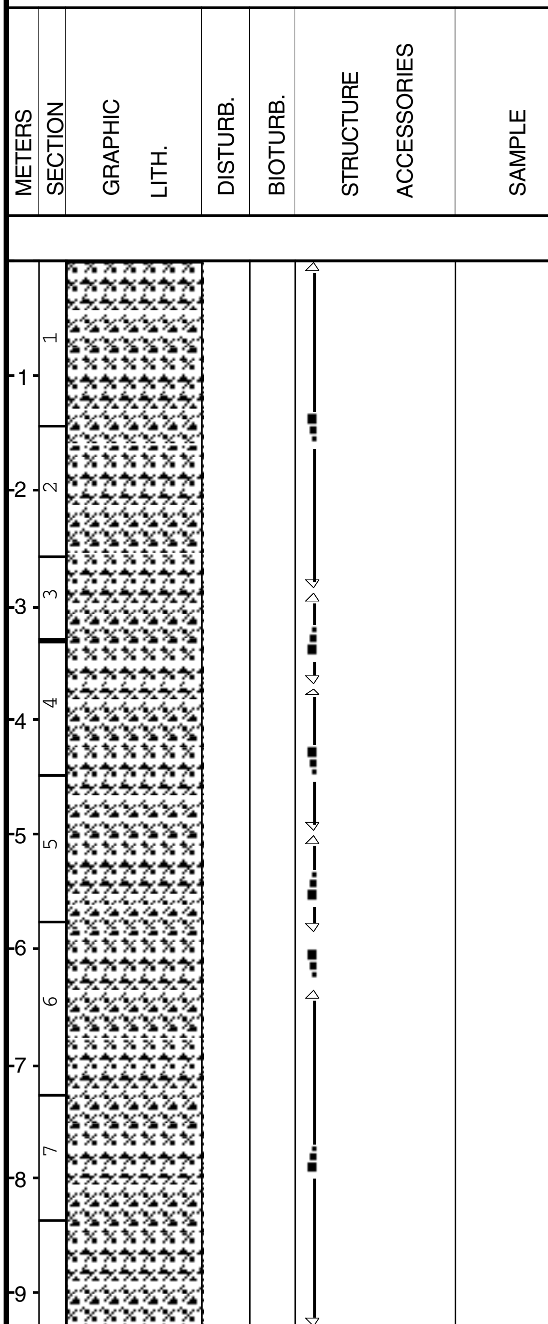
Major Lithologies:

VITRIC LITHIC TUFF and VITRIC LITHIC LAPILLI-TUFF are poorly sorted with angular to subangular grains, and vary from dark gray (N3) to dark reddish gray (10R 4/1) to weak red (10R 5/2). Section 1, 0-17 cm is dark gray massive LITHIC LAPILLISTONE composed mostly of coarse ash and granule-sized lapilli. Section 1, 17 cm to Section 2, 50 cm is dark reddish gray massive very coarse VITRIC LITHIC TUFF with grain size ranging from medium sand to small pebble. Section 2, 50 cm to Section 8, 140 cm is a single bed o weak red VITRIC LITHIC TUFF. Fabric is dominantly massive although poorly defined bedding (subhorizontal to ~20 degrees of apparent dip) occurs in some intervals. Bed also contains gradational increases and decreases in pebble content (≤50% in Section 4, 80-100 cm; 5% in Section 2, 120 cm to Section 3, 30 cm and Section 4, 100-110 cm). Maximum lapilli size exceeds 3 cm, and the larger lapilli are subrounded, red, fragments of TUFF.

The VITRIC LITHIC TUFF is composed of 50% lithic fragments (generally subrounded and subequant), 25% altered glass shards and 25% matrix. The lithic fragments include, in approximate order of decreasing abundance: iron-oxide-stained lapilli, pinkish-brown lapilli (nonvesicular to moderately vesicular), white pumiceous (highly vesicular) or fine-grained crystalline lapilli, and gray basaltic lapilli. Accretionary lapilli are sparse (1%) throughout the whole core. Sections 3–4 and 6–8 contain examples of reworked lapilli. One of the clearest examples of reworking can be found in Section 7 where red clay coated accretionary and armored lapilli occur within a rounded 2-cm lapillus.

Core Photo

Site 1184 Hole A Core 25R Cored 326.2-335.9 mbsf



DESCRIPTION

VITRIC LITHIC TUFF and VITRIC LITHIC LAPILLI-TUFF

AGE: middle Eocene

Major Lithologies:

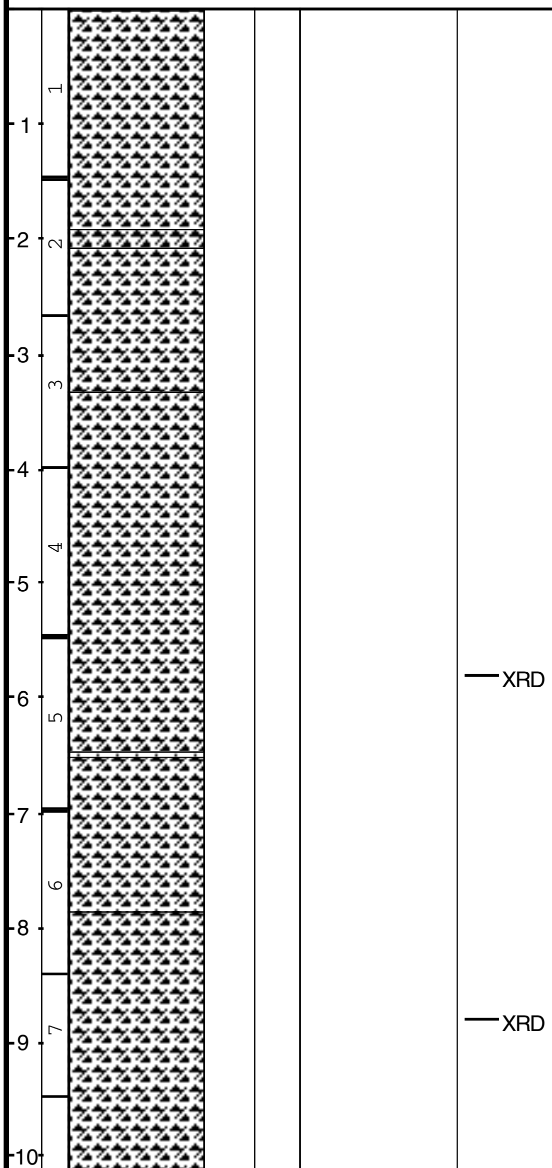
VITRIC LITHIC TUFF and VITRIC LITHIC LAPILLI-TUFF are massive and poorly sorted, with gradual changes in average grain size. Lapilli are rounded to subrounded. The proportion of pebble-sized lithic lapilli varies from 15% to 60%. The largest lapilli exceed 3 cm in diameter (e.g., Section 4 at 0-3 cm; Section 7 at 70 cm). Color changes are gradual. Color varies from gray (5YR 6/1) and pinkish gray (5YR 6/2) to pale red (2.5YR 6/2), and is dark greenish gray (5G 4/1) in Section 3, 0-45 cm. The color variation reflects both the relative abundance of red lithic lapilli and oxidation of the matrix. An elongate (4 cm by 0.1 cm) wood fragment(?) occurs in Section 8, 87 cm.

The VITRIC LITHIC TUFF and VITRIC LITHIC LAPILLI-TUFF are composed of 60% lithic fragments (generally subrounded and subequant), 20% altered glass shards and 20% matrix (fine particles). The lithic fragments include, in approximate order of abundance: iron-oxide-stained lapilli, pinkish-brown lapilli (nonvesicular to moderately vesicular), white pumiceous (highly vesicular) or fine-grained crystalline lapilli, and gray basaltic lapilli. Accretionary lapilli are sparse (1%) throughout the core. Reworking of the LITHIC VITRIC TUFF can be seen throughout Core 25R. The clearest examples of reworking can be seen in the pebble-sized lapilli in Sections 6–8.

Core Photo

Site 1184 Hole A Core 26R Cored 335.9-345.6 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



VITRIC LITHIC LAPILLI-TUFF

AGE: middle Eocene

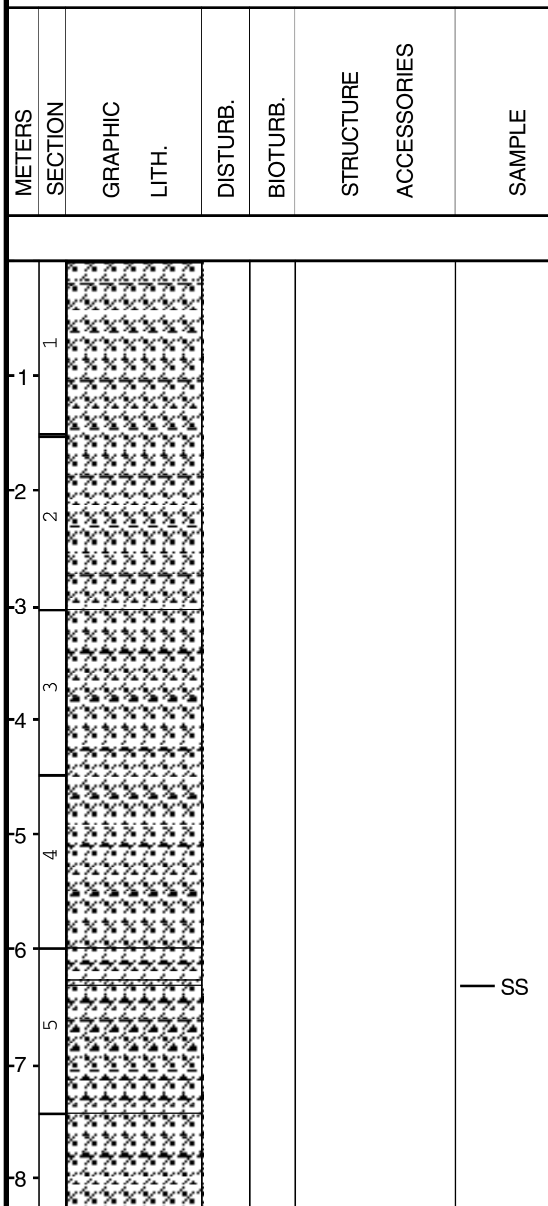
Major Lithologies:

VITRIC LITHIC LAPILLI-TUFF is massive without clearly discernable internal bedding. Lapilli are poorly sorted, subangular to subrounded, and ≤10 mm in size. There are no apparent trends in grain size through the core. The proportion of pebble-sized lithic lapilli varies from 20% to 40%. A clast of reworked tuff >8 cm long occurs Section 5, 98-106 cm. Color varies from brown (7.5YR 5/2) to weak red (2.5YR 4/2) to gray (N6) and reflects both the relative abundance of red lithic lapilli and oxidation of the matrix.

The VITRIC LITHIC LAPILLI-TUFF has an average composition of 50% lithic fragments (generally subrounded and subequant), 25% altered glass shards and 25% matrix. The lithic fragments include, in approximate order of decreasing abundance: iron-oxide-stained lapilli, pinkish-brown lapilli (nonvesicular to moderately vesicular), white pumiceous (highly vesicular) or fine-grained crystalline lapilli, and gray basaltic lapilli. Accretionary lapilli are rare. Reworking of the LAPILLI-TUFF can be seen throughout Core 26R. Two large pebbles are found in Section 5 from 19.5 to 22 cm and from 99 to 105.5 cm. The larger of the two contains smaller lapilli up to 2 cm in size and broken accretionary lapilli. In contrast, the other pebble is aphanitic.

Core Photo

Site 1184 Hole A Core 27R Cored 345.6-355.3 mbsf



DESCRIPTION

VITRIC LITHIC LAPILLI-TUFF and VITRIC LITHIC LAPILLISTONE

AGE: middle Eocene

Major Lithologies:

VITRIC LITHIC LAPILLI-TUFF and LAPILLISTONE is gray (N5) to very dark gray (5YR 3/1) to brown (7.5YR 4/2), and contains poorly sorted, massive, rounded to subangular lapilli up to 3 cm diameter. Grain size increases gradually from the base of the core to Section 5, 80 cm and then decreases gradually to the top. Color changes are gradual and seem to reflect both the relative abundance of red lithic lapilli and oxidation of the matrix.

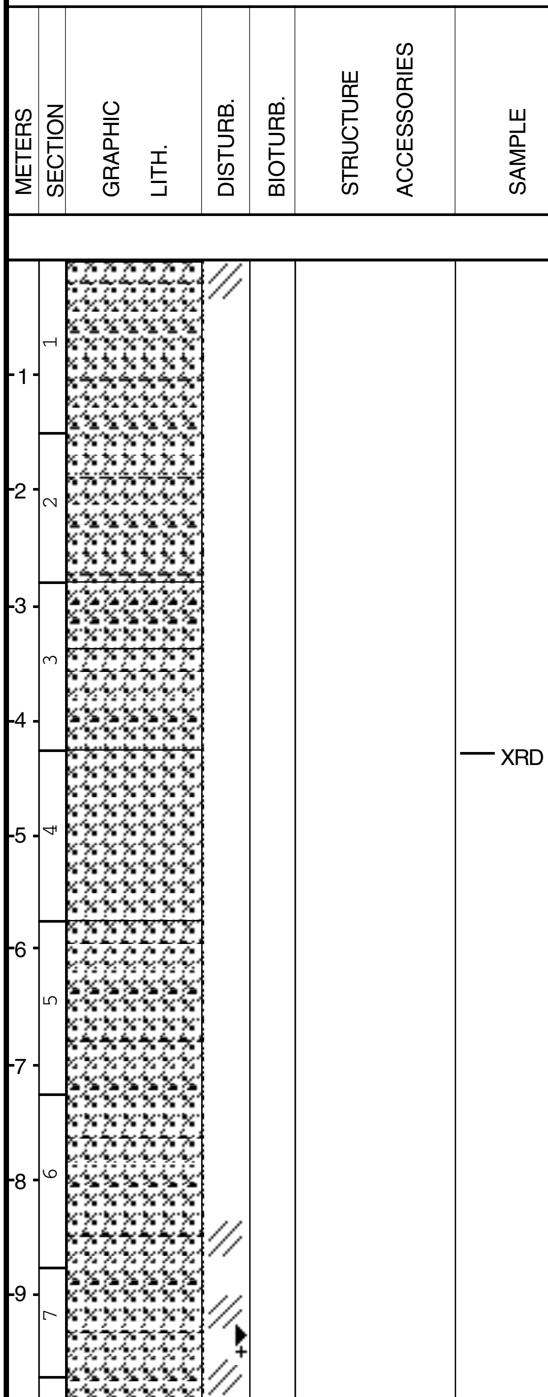
The VITRIC LITHIC LAPILLI-TUFF and VITRIC LITHIC LAPILLISTONE are composed of 50% lithic fragments (generally subrounded and subequant), 25% altered glass shards and 25% matrix. The lithic fragments include, in approximate order of decreasing abundance: iron-oxide-stained lapilli, pinkish-brown lapilli (nonvesicular to moderately vesicular), gray basaltic lapilli, and white pumiceous (highly vesicular) or fine-grained crystalline lapilli. Accretionary lapilli are rare (<1%) apart from Section 4. Reworking of the LITHIC VITRIC TUFF can be seen in lapilli and pebbles throughout Core 27R.

Minor Lithologies:

ZEOLITIC TUFF, 5-cm thick (Section 5, 29-34 cm), light gray (N7), is laminated, with a sharp base and erosional top. A small rip-up clast occurs in the lower cm of the overlying LAPILLI-TUFF.

Core Photo

Site 1184 Hole A Core 28R   Cored 355.3-365.0 mbsf



DESCRIPTION

VITRIC LITHIC LAPILLI-TUFF to VITRIC LITHIC LAPILLISTONE

AGE: middle Eocene

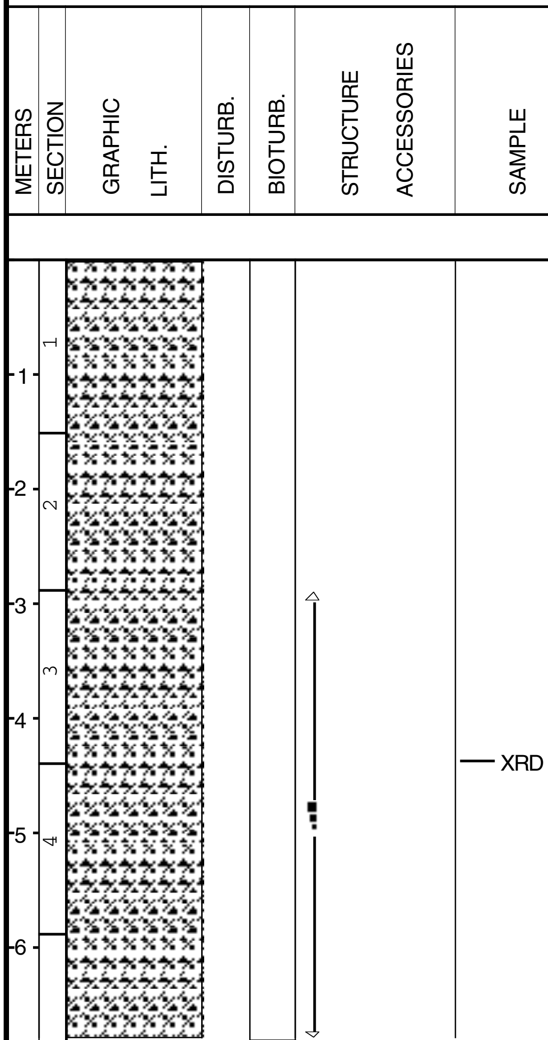
Major Lithologies:

VITRIC LITHIC LAPILLI-TUFF and VITRIC LITHIC LAPILLISTONE are greenish gray (5GY 5/1, 10Y 6/1) to dark greenish gray (10Y 4/1) to gray (5Y 5/1), poorly sorted and massive, with rounded to subangular lapilli ≤3 cm. Minimum grain size is medium to coarse sand. The interval from Section 3, 0-60 cm has a slightly higher percentage of pebbles. Color changes are gradual. White veins occur at Section 1, 3-15 cm, Section 2, 64-70 cm, and Section 5, 60-68 cm.

The core is composed of 50% lithic fragments (generally subrounded and subequant), 25% altered glass shards and 25% matrix (fine particles). The lithic fragments include, in approximate order of decreasing abundance: pinkish-brown lapilli (nonvesicular to moderately vesicular), gray basaltic lapilli, iron-oxide-stained lapilli, and white pumiceous (highly vesicular) or fine-grained crystalline lapilli. Accretionary lapilli are rare (<1%) except in Section 4. Reworking of the LITHIC VITRIC TUFF can be seen in lapilli and pebbles throughout Core 28R.

Core Photo

Site 1184 Hole A Core 29R Cored 365.0-374.7 mbsf



DESCRIPTION

LITHIC LAPILLI-TUFF to LITHIC LAPILLISTONE

AGE: middle Eocene

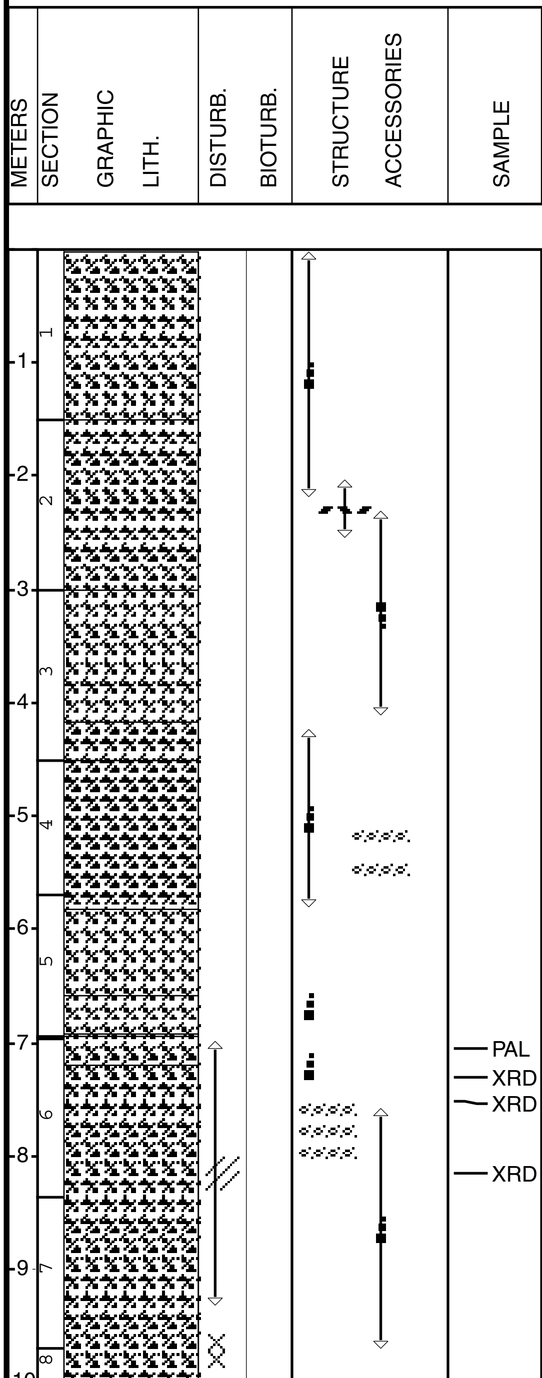
Major Lithologies:

VITRIC LITHIC LAPILLI-TUFF and VITRIC LITHIC LAPILLISTONE are dark greenish gray (5G 4/1) and very coarse, with abundant (15-20%) granule- and pebble-sized lithic lapilli; clast-supported, very poorly sorted, and massive. This bed continues through overlying Core 28R. The largest lapilli are 2- to 3-cm diameter, but most are less than 1-cm diameter. There is subtle reverse grading in Sections 3 through 5 as the larger lithic lapilli increase in abundance. A circular, 1-cm diameter, black wood fragment is present in Section 5 at 17 cm.

The core is composed of 5% altered glass shards, 50% lithic lapilli, and 45% matrix. The glassy fragments are altered either pervasively or at the rim to blue-green clay. Most of the glassy fragments are found in large (>8 mm) red lithic clasts. Lithics are mostly subelongate and subangular. Lithic lapilli are dominantly pinkish gray and include slightly vesicular, nonvesicular and plagioclase-phyric varieties. Next in abundance are gray-green lapilli, which are completely altered to clay. Other types include rip-up clasts of VITRIC LITHIC TUFF, oxidized red-brown lapilli, and plagioclase-rich lapilli. Accretionary lapilli occur sparsely (≤12 per section); some are oxidized. An armored lapillus is present in Section 3 at 103 cm. The matrix is granular and contains subangular crystalline grains together with finer material.

Core Photo

Site 1184 Hole A Core 30R Cored 374.7-384.4 mbsf



DESCRIPTION

VITRIC LITHIC LAPILLI-TUFF, VITRIC LITHIC LAPILLISTONE, and VITRIC LITHIC TUFF,

AGE: middle Eocene

Major Lithologies:

From Section 1, 0 cm to Section 3, 118 cm, the core is LITHIC LAPILLI-TUFF, dark greenish-gray (5G 4/1) to gray (N4), consisting of pebble-sized lithic lapilli (10% to 40%) in a matrix of coarse, poorly sorted ash. The relative average grain size through this interval shows subtle changes: reversely graded from Section 3, 118 cm through Section 2, 80 cm; normally graded from Section 2, 80 cm through Section 1, 0 cm and into the overlying Core 28R. The LITHIC LAPILLI-TUFF consists of 5% altered glass shards, 35—80% lithic lapilli, 15—60% matrix and ~1% accretionary lapilli. The amount of compaction generally increases down core, with a maximum in Section 3 at 74—87 cm where interlocking lapilli are present. The glass is altered to light greenish gray clay. The lithic fragments are, on average, 4 mm, although lapilli up to 5 cm in diameter occur. The largest lapilli (generally equant and rounded) are rip-up clasts of VITRIC LITHIC TUFF. Accretionary lapilli are present throughout. Carbonized wood occurs in Section 1 at 74 cm.

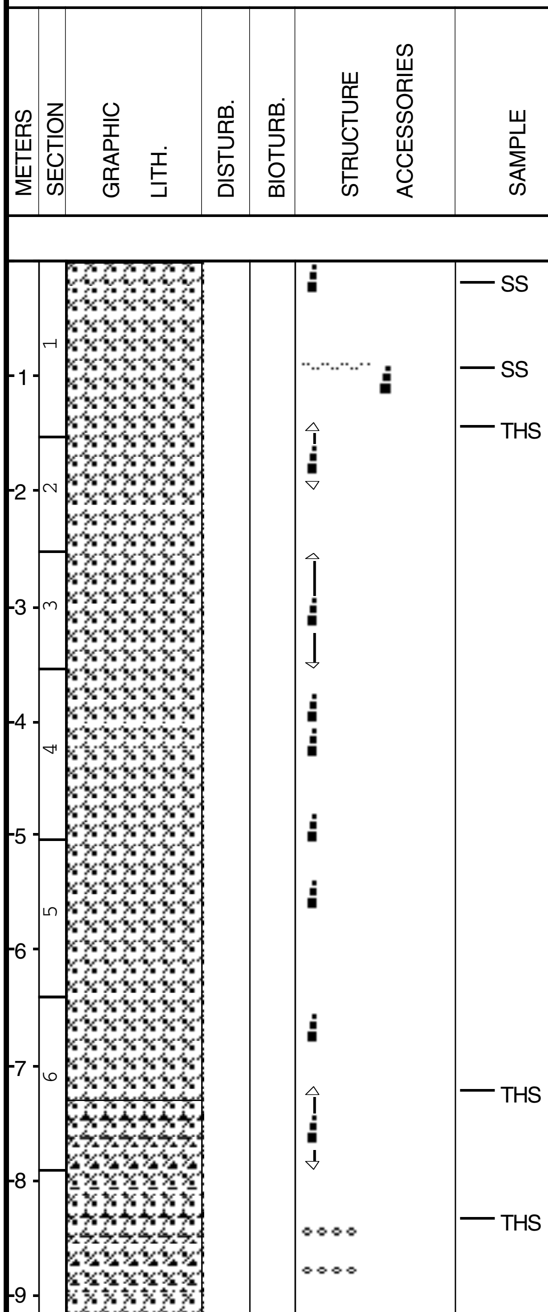
From Section 3, 118 cm to Section 5, 13 cm, the core is LITHIC LAPILLISTONE, fining upward to gray (N4) LITHIC TUFF. The LITHIC TUFF contains 95% lithic fragments and 5% matrix. The larger lapilli are predominantly subangular and elongate, 1—4 mm in size (average ~2 mm) and form bands that are 2 to 3 cm thick. The smaller lapilli are subangular to subrounded and equant. Lithic lapilli are mostly brownish, consisting of microcrystalline tuff and minor porphyritic lithologies. Other lithic fragments include greenish VITRIC LITHIC TUFF, gray lithic fragments showing subtrachytic textures, and white slightly vesicular lapilli. Accretionary lapilli fragments are rare.

Section 5, 13-92 cm is massive LITHIC TUFF, dark greenish gray (5GY 4/1), composed of pebble-sized accretionary lapilli in an ash matrix. Section 5, 92 cm to Section 6, 24 cm, has four normally graded beds of LITHIC TUFF that are dark gray (N4), very coarse to medium-grained, with sharp or scoured bases. Flattened wood fragments or other organic debris are found in Section 5, 100 cm and in Section 6, 9 cm. The relatively fine-grained LITHIC TUFF has bands that are rich in whole and broken accretionary lapilli. TheLITHIC TUFF consists of 80% ash matrix and 20% accretionarylapilli. Pyrite is present, concentrated mainly in the areas rich inbroken accretionary lapilli. Alternating coarse- (~4 mm) andfine-grained (<1 mm) lapilli and ash layers extend from Section 5,117 cm to Section 6, 24 cm.

From Section 6, 24 cm through Section CC, the core is normallygraded LITHIC TUFF and LITHIC LAPILLI-TUFF. Color varies fromdark greenish gray (5BG 4/1) to dark gray (N3) to weak red (10R4/2). The LITHIC TUFF contains 30% lithic fragments, 5%accretionary lapilli and 65% silt-sized matrix. Carbonized woodfragments are rare. The largest lithic fragments are 4 mm in size; themajority are 1—2 mm. Lithic fragments include gray basaltic lapilli,pinkish brownish gray lapilli, greenish gray lapilli andplagioclase-rich lapilli. Oxidized reddish brown (2.5YR 4/4) roundedgranule-sized lapilli are common, and are abundant in Section 6 at50-60 cm. Accretionary lapilli are numerous, locally making up ~50%of the rock.

Core Photo

Site 1184 Hole A Core 31R Cored 384.4-394.1 mbsf



DESCRIPTION

VITRIC LITHIC TUFF

AGE: middle Eocene

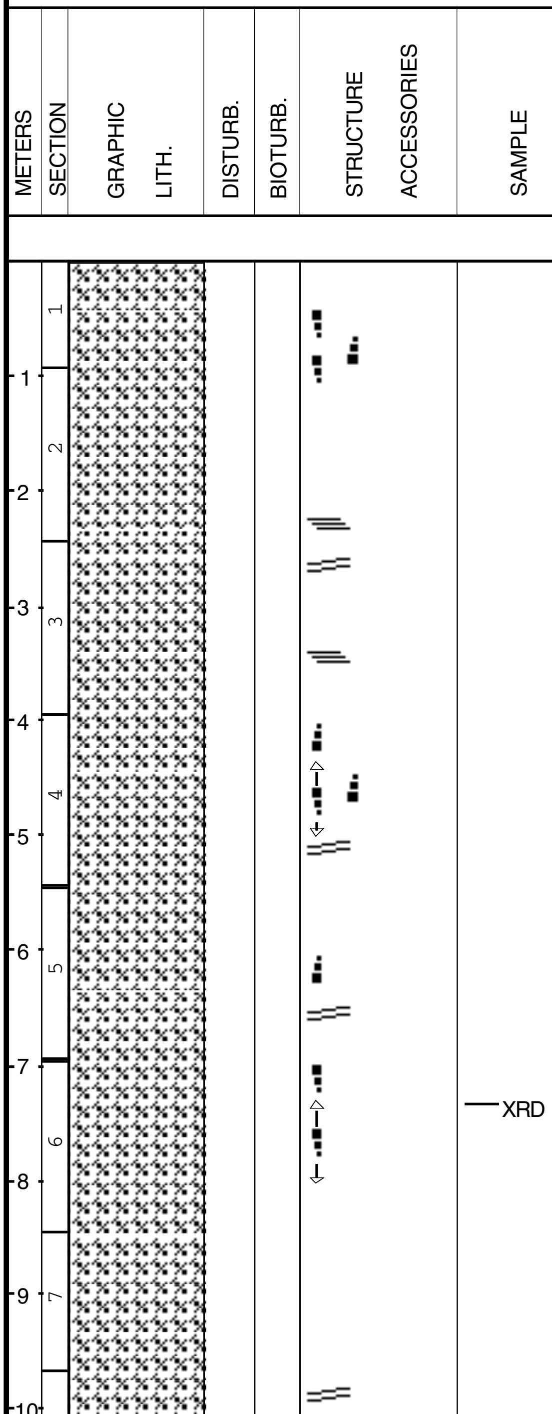
Major Lithologies:

VITRIC LITHIC TUFF, dark gray (N3) to dark greenish gray (5Y 3/1), has a general fining upward trend from Section 7 to Section 1. Within this interval are several normally graded beds with relatively sharp bases varying in grain size from very coarse to very fine sand. Several layers have an apparent 10-degree dip. A possible cross-laminated interval occurs in Section 6 at 60-70 cm, and several coarse-grained laminae occur in Section 7. Lithic lapilli and accretionary lapilli are generally rare, but are common in some intervals (e.g., Section 2, 45-55 cm). Glass shards are abundant in Section 1, 0-15 cm and Section 1, 89 cm.

The VITRIC LITHIC TUFF in Sections 6 and 7 is composed of 10-15% altered glass shards, 40-45% lithics, and 45% matrix. Glass shards are angular to subrounded and subelongate, ranging in size from <1 to 6 mm. The top of Section 7 appears to have fresh glass. Lithics are ≤10 mm in size, and are mainly subangular and subequant. Lithics are mostly aphanitic, pinkish brown, and nonvesicular to sparsely vesicular. Other lithics include light-gray, sparsely vesicular fragments. Rip-up clasts of LITHIC VITRIC TUFF and accretionary lapilli ≤9 mm are also present. The matrix is composed of fine glass shards, lithic ash, rare iron oxyhydroxide grains, and other intergranular material.

Core Photo

Site 1184 Hole A Core 32R Cored 394.1-403.8 mbsf



DESCRIPTION

VITRIC LITHIC TUFF

AGE: middle Eocene

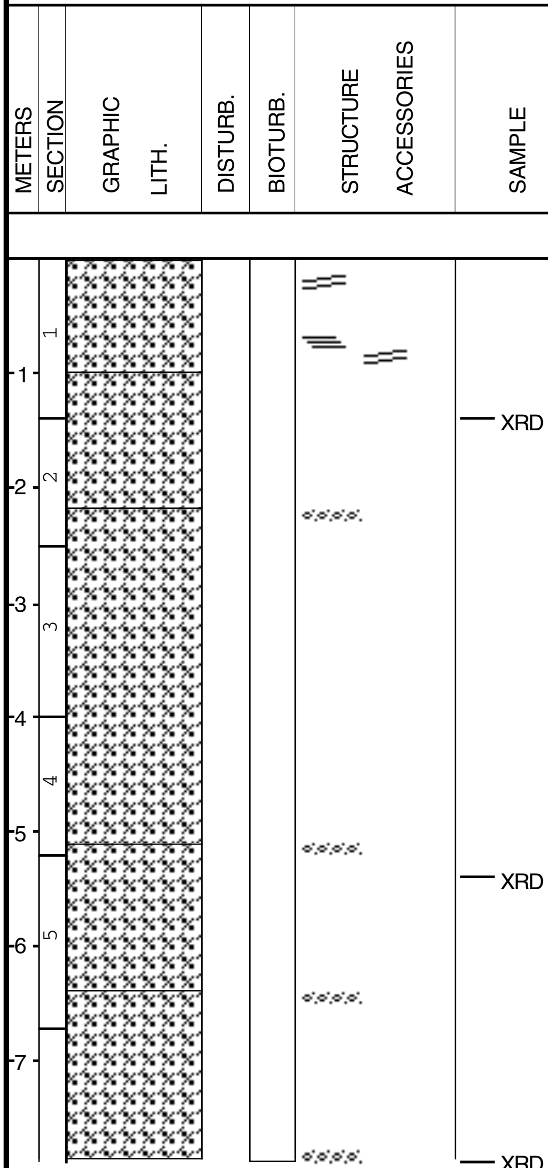
Major Lithologies:

VITRIC LITHIC TUFF is light greenish gray (5G 7/1) to greenish black (10Y 2/1), with subangular to rounded grains. Grain size ranges from medium sand to granule. Poorly sorted intervals with indistinct bedding and gradational variation in average grain size between 0.3 mm and 2 mm are present from Section 1, 0 cm to Section 2, 126 cm; Section 4, 0-110 cm; Section 4, 130 cm to Sectio 5, 100 cm; and Section 5, 130 cm to Section 7, 120 cm. The remainder of the core contains parallel, inclined (up to 10 degrees) beds with the same range in grain size. Color variation reflects proportion of altered glass shards and matrix.

The VITRIC LITHIC TUFF in Sections 4 through 8 is composed of 15–25% altered glass shards, 40–60% lithic, and 30% matrix. Glass shards are angular to subrounded and subelongate, ranging in size from <1 to 4 mm. Lithics are ≤10 mm, and are mainly subangular and subequant. Lithics are mostly aphanitic, pinkish brown, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards, lithic ash, and other intergranular material.

Core Photo

Site 1184 Hole A Core 33R Cored 403.8-413.5 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

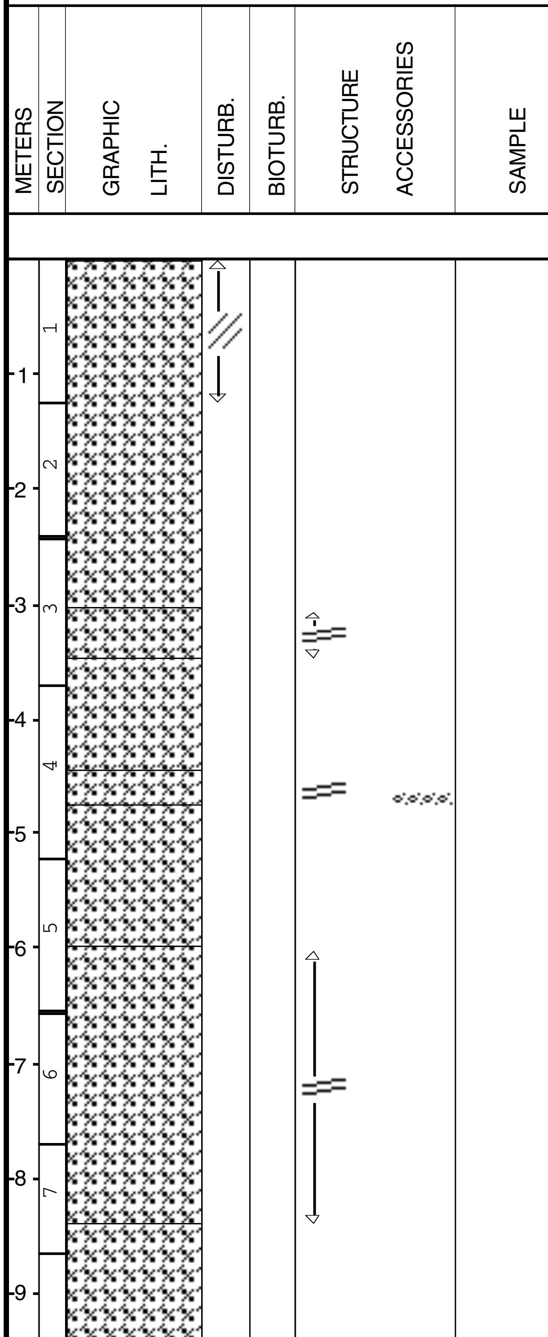
Major Lithologies:

LITHIC VITRIC TUFF is dark greenish gray (5G 4/1) to greenish gray (5G 4/1) and has subangular to rounded grains. Grain size ranges from medium sand to granule. Section 1, 0-100 cm is medium bedded, medium to very coarse sand-sized ash with parallel, inclined beds and both normal and reverse grading within beds. Section 1, 100 cm to Section 6, 118 cm is poorly sorted, very thickly bedded, very coarse sand-sized ash with subtle reverse grading, and bedding contacts defined by lapilli concentrations at the tops of beds.

The LITHIC VITRIC TUFF is composed of 35% altered glass shards, 40% lithics, and 25% matrix. Glass shards are angular to subrounded and subelongate, ranging in size from <1 mm to 4 mm. Lithics are ≤10 mm in size, and are mainly subangular and subequant. Lithics are mostly aphanitic, pinkish brown, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards, lithic ash, and other intergranular material.

Core Photo

Site 1184 Hole A Core 34R Cored 413.5-423.2 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

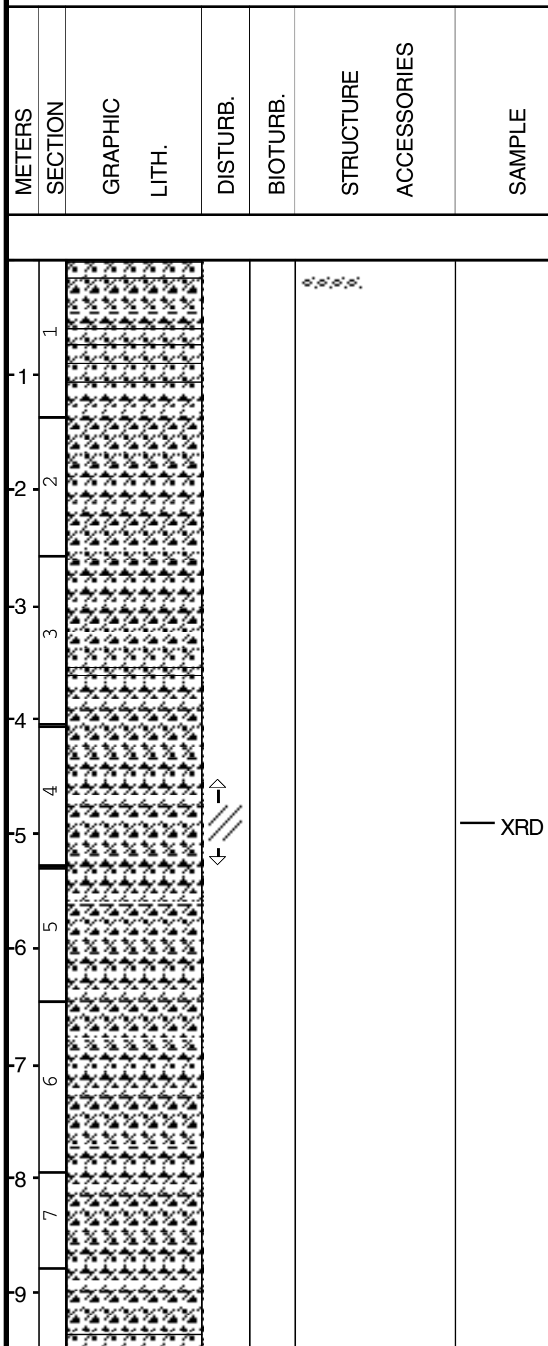
Major Lithologies:

LITHIC VITRIC TUFF is greenish gray (5G 5/1) to dark greenish gray (10GY 3/1), and has subangular to rounded grains. Grain size ranges from medium sand to granules. The core is massive and poorly sorted, with no apparent trend in grain size from Section 1, 0 cm to Section 3, 57 cm; Section 3, 110 cm to Section 4, 75 cm; Section 4, 107 cm to Section 5, 80 cm; and Section 7, 70 cm to Section 8, 80 cm. The remainder of the core is medium-bedded, medium to very coarse sand-sized ash with parallel and inclined beds.

The LITHIC VITRIC TUFF is composed of 30% altered glass shards, 30% lithics, and 40% matrix. Glass shards are angular to subrounded and subelongate, ranging in size from <1 to 4 mm. Lithics are ≤10 mm in size, and are mainly subangular and subequant. Lithics are mostly aphanitic, pinkish brown, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards, lithic ash, and other intergranular material.

Core Photo

Site 1184 Hole A Core 35R Cored 423.2-432.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF, LITHIC VITRIC LAPILLI-TUFF and LITHIC VITRIC LAPILLISTONE

AGE: middle Eocene

Major Lithologies:

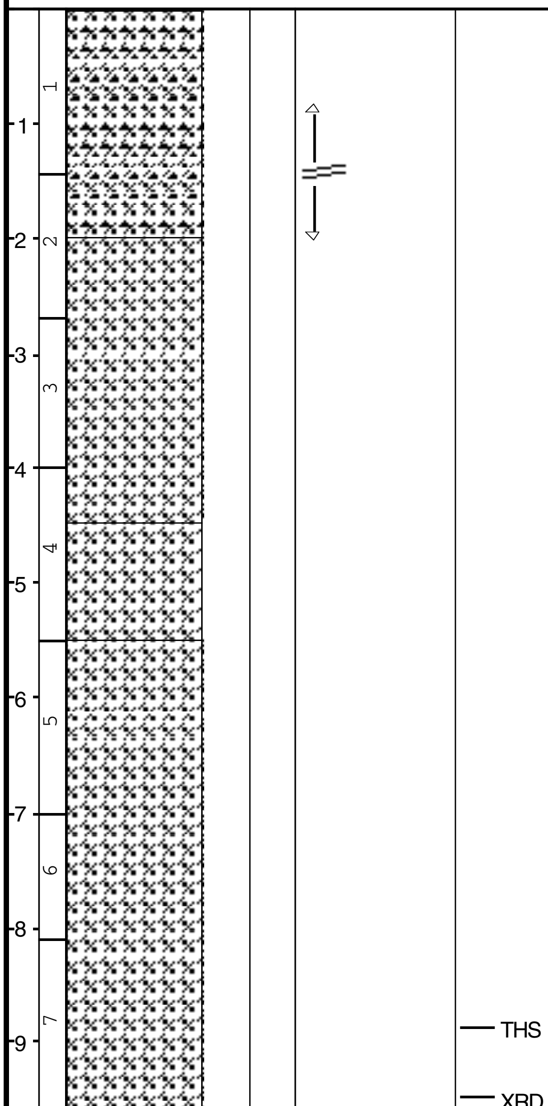
LITHIC VITRIC LAPILLI-TUFF and LITHIC VITRIC LAPILLISTONE are greenish gray (10Y 6/1) to dark greenish gray (10GY 4/1), with subangular to subrounded grains. Grain size ranges from coarse sand to pebble. Section 1, 0-60 cm has parallel beds defined by abundant lapilli and very coarse sand-sized ash. Section 3, 97-104 cm and Section 8, 57-75 cm consist of LITHIC VITRIC TUFF. The remainder of the core is composed of thickly bedded massive LITHIC VITRIC LAPILLISTONE. There are gradual changes in average grain size within beds. Elongate grains tend to be subhorizontal. A carbonate-filled vein 1.3-cm wide spans Section 4, 57-122 cm.

Components are 25% altered glass shards, 40% lithics, and 35% matrix. Glass shards are angular to subrounded and subelongate, ranging in size from <1 to 4 mm. Lithics are ≤10 mm in size, and are mainly subangular and subequant. Lithics are mostly aphanitic, pinkish brown, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards and other intergranular material with white cement.

Core Photo

Site 1184 Hole A Core 36R Cored 432.9-442.6 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC VITRIC TUFF to LITHIC VITRIC LAPILLI-TUFF

AGE: middle Eocene

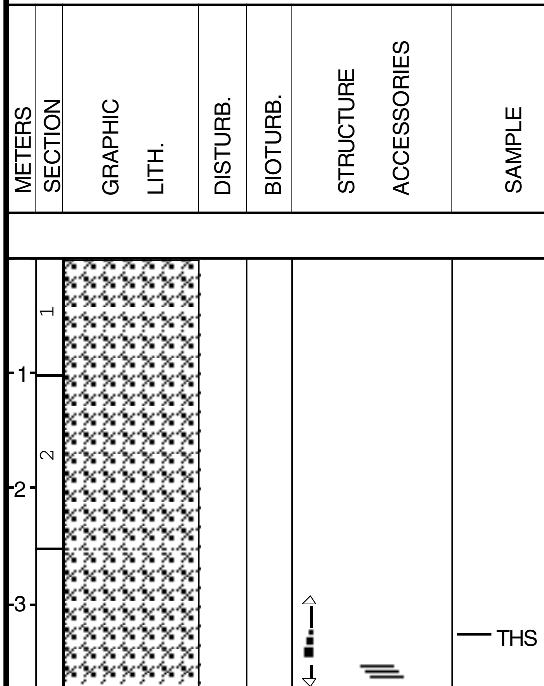
Major Lithologies:

LITHIC VITRIC TUFF is greenish black (10Y 2/1) to dark greenish gray (10GY 3/1), with an overall coarsening-upward trend through the core, culminating with beds of LITHIC VITRIC LAPILLI-TUFF, dark gray (N3) in Section 1, 0 to 70 cm. The TUFF is moderately to poorly sorted, and grain size varies from medium to very coarse sand, with variable amounts of granule-sized lithics and accretionary lapilli. The TUFF is medium-bedded, with individual beds varying in average grain size and abundance and types of lithics. Laminae within the very coarse TUFF in Sections 1 and 2 dip at approximately 25-30 degrees, and are interpreted as sedimentary cross bedding. Within the relatively fine-grained region in Section 7 is a zone of calcite veins with 1-mm crystals (Section 7, 130-144 cm) and a band with abundant wood fragments (Section 7, 85-90 cm).

In Sections 1 through 4, the LITHIC VITRIC TUFF is composed of 1-3% altered glass shards, 3-5% lithic, and 92-96% fine ash matrix. No lapilli occur in Sections 5 through 7. Glass shards are angular to subrounded and subelongate, ranging in size from <1 to 2 mm. Lithics are <1 to 3 mm in size, and are mainly subangular and subelongated. Lithics are mostly aphanitic, gray, and nonvesicular to sparsely vesicular.

Core Photo

Site 1184 Hole A Core 37R Cored 442.6-452.3 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

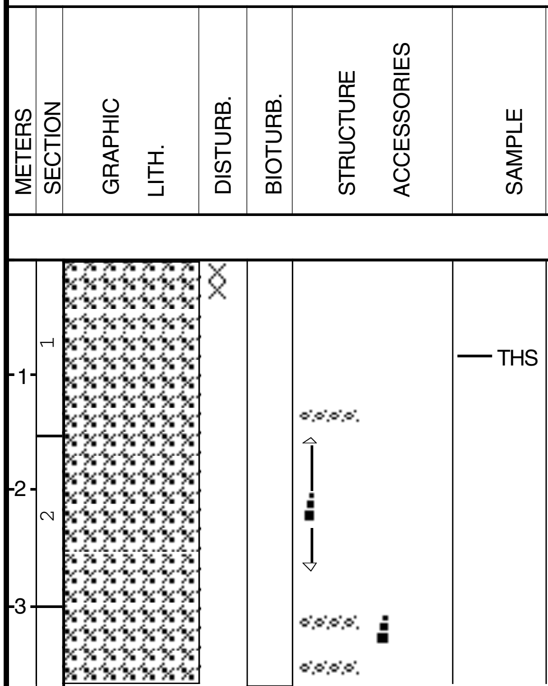
Major Lithology:

LITHIC VITRIC TUFF is dark greenish gray (10Y 3/1), massive, and moderately to well sorted, with common 1-mm lithics. Grain size varies from fine to medium sand. Wood fragments (including 1-cm-diameter pieces) and other organic-matter layers and streaks are common in Section 1 at 75-102 cm, in Section 2 at 85-90 cm, and in Section 3 at 44-51 cm. A few accretionary lapilli occur in Section 2, and are abundant in the lower half of Section 3.

The TUFF in Section 3, 40-120 cm, is normally graded. The lower coarse-grained LITHIC VITRIC TUFF is composed of 5-10% altered glass shards, 10-15% lithics, 1-3% accretionary lapilli and 75-80% matrix. Glass shards are angular to subrounded and subequant, ranging in size from <1 to 3 mm. Lithics are ≤7 mm in diameter, and are mainly subangular and subequant. The most abundant lithics are aphanitic, pinkish brown, and nonvesicular tuff and lighter gray or white, sparsely microvesicular and sparsely phyric. The accretionary lapilli are green with rare pinkish brown nucleii and range from 2 to 8 mm. The matrix is composed mostly of fine glass shards and lithic ash.

Core Photo

Site 1184 Hole A Core 38R Cored 452.3-461.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

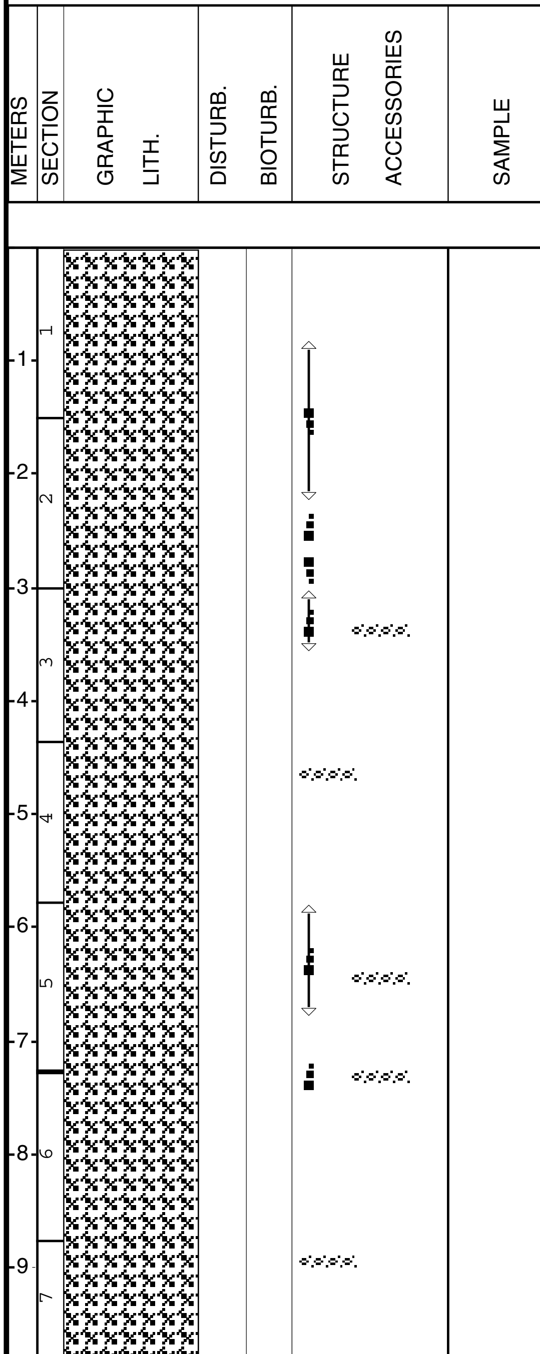
Major Lithology:

LITHIC VITRIC TUFF is dark greenish gray (10Y 3/1), poorly to moderately sorted, and massive, with subtle normally graded intervals. Grain size varies from fine to coarse sand. Accretionary lapilli are abundant in Section 1 at 130-140 cm and in Section 2 at 15 to 90 cm. Round, bluish white, mm-size bodies in Section 1 at 60-80 cm may be chalcedony fillings.

Thin (<2 cm), irregular layers of altered glass and lithics occur in finer-grained intervals, particularly at the bottom of Section 1. Altered glass shards in these layers are green to dark green with black rims, are ≤4 mm in size, and are angular to subrounded and subequant. They comprise ≤2% of the coarse grains. The lithic fragments are mainly gray to pinkish-brown, ≤4 mm across, angular to subrounded, and subelongate. They comprise 0 to 5% of the coarse material. The accretionary lapilli are dark green-gray and ≤14 mm in diameter. Some are deformed and subelongate; others are completely broken. The matrix is composed mostly of fine glass shards and lithic ash.

Core Photo

Site 1184 Hole A Core 39R Cored 461.9-471.5 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

Major Lithologies:

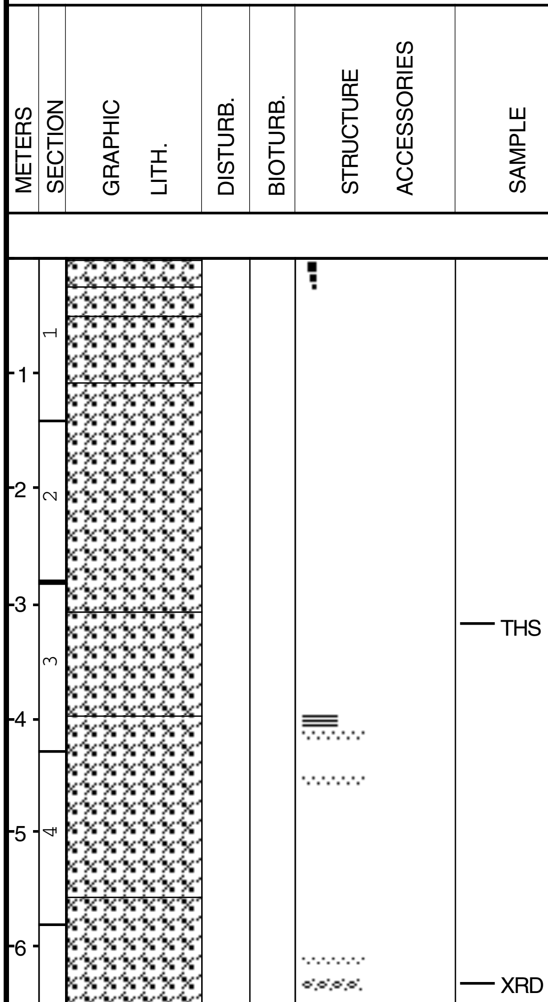
LITHIC VITRIC TUFF, dark greenish gray (10Y 3/1), is poorly to very poorly sorted and has grain sizes varying from very fine to coarse sand. There is a general fining-upward trend through the core. Beds are massive, with both normally and reversely graded intervals within beds. Calcite veins of variable orientation are spaced at approximately 50-cm intervals. Lithic lapilli and accretionary lapilli are common in some intervals. The matrix consists mostly of fine glass shards and lithic ash. The core can be divided into two main lithologies:

From the top of Section 1 to Section 5, 100 cm, the core is fine sand-sized LITHIC VITRIC TUFF consisting of 2—20% glass shards, 10-30% lithic fragments, 2% accretionary lapilli and 50—80% matrix. Altered glass shards are either blue-green or brighter green with black rims; rare calcite rims are observed. Shards are equant to irregular and mostly subrounded. They average 1 mm, with a maximum of 2 mm. Some glass shards are black and fresh; the proportion of fresh glass is ≤20% of the total glass. Lithics are <1 mm to 5 cm, subequant to subelongate, and mostly subangular. They include four main types: pink vesicular lapilli (80% of lithic lapilli); white vesicular lapilli; pink, white, greenish or violet pumice; and rare translucent colorless lithic lapilli. Accretionary lapilli are sparse in the top of Section 1, and increase in abundance toward Section 2 at 54—74 cm, where armored lapilli are also present. Accretionary lapilli are generally sparse throughout the lower part of the core. Some accretionary lapilli have iron oxyhydroxide rims. Abundant accretionary lapilli are present in Section 5, 95-100 cm.

From Section 5, 100 cm, to the bottom of Section 7, the core is medium sand-sized LITHIC VITRIC TUFF consisting of 15-20% glass shards, 20—25% lithics and ~65% matrix. The glass shards are dull blue to yellowish black, with black rims. Shards are <0.05 to 3 mm, averaging ~1 mm, and angular to subrounded (mainly subangular). Some glass shards have fresh interiors with altered rims. Lithic fragments are pinkish-brown to gray, <0.05 to 10 mm, mainly angular and subequant to subelongate. Lithics consist mainly of two major types: brownish to gray, aphanitic, nonvesicular to slightly vesicular basalt, and white to light gray, vesicular to nonvesicular basalt. A few subrounded equant TUFF fragments are also present.

Core Photo

Site 1184 Hole A Core 40R Cored 471.5-481.1 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

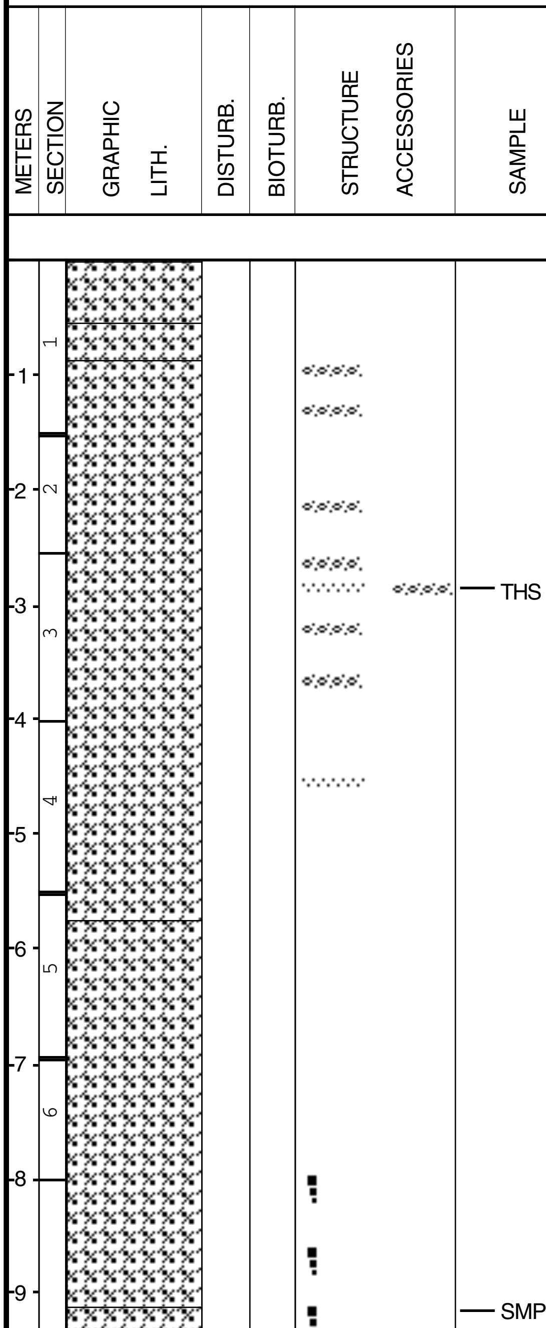
Major Lithology:

LITHIC VITRIC TUFF, gray (N5) to light gray (N6), is composed of moderately to poorly sorted ash with lapilli in some intervals. Horizontal beds of moderately to poorly sorted, fine to coarse sand-sized ash span Section 3, 115-125 cm and Section 4, 127 cm t Section 5, 71 cm. Horizontal ash laminae are present in Section 3, 133 cm to Section 4, 31 cm. Section 1, 0-25 cm is reversely graded. The remainder of the core is composed of alternating coarse and fine, medium bedded LITHIC VITRIC TUFF. Accretionary lapilli, 3–6 mm, are present in Section 3, 100-105 cm and Section 4, 120-12 cm. Color grades from gray to pinkish gray (5YR 7/1, 5YR 6/2) in Section 3, 123-130 cm and Section 5, 50-67 cm.

The LITHIC VITRIC TUFF is composed of 15% glass shards, 25% lithics, and 60% matrix. Glass shards are subangular to subrounded and subelongate to subequant, and range in size from <1 to 3 mm. Lithics are ≤6 mm, and are mainly angular to subangular and subequant. The predominant lithics are aphanitic, gray, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards, lithic ash, and other intergranular material with white cement.

Core Photo

Site 1184 Hole A Core 41R Cored 481.1-490.7 mbsf



DESCRIPTION

LITHIC VITRIC TUFF and LITHIC VITRIC LAPILLI-TUFF

AGE: middle Eocene

Major Lithology:

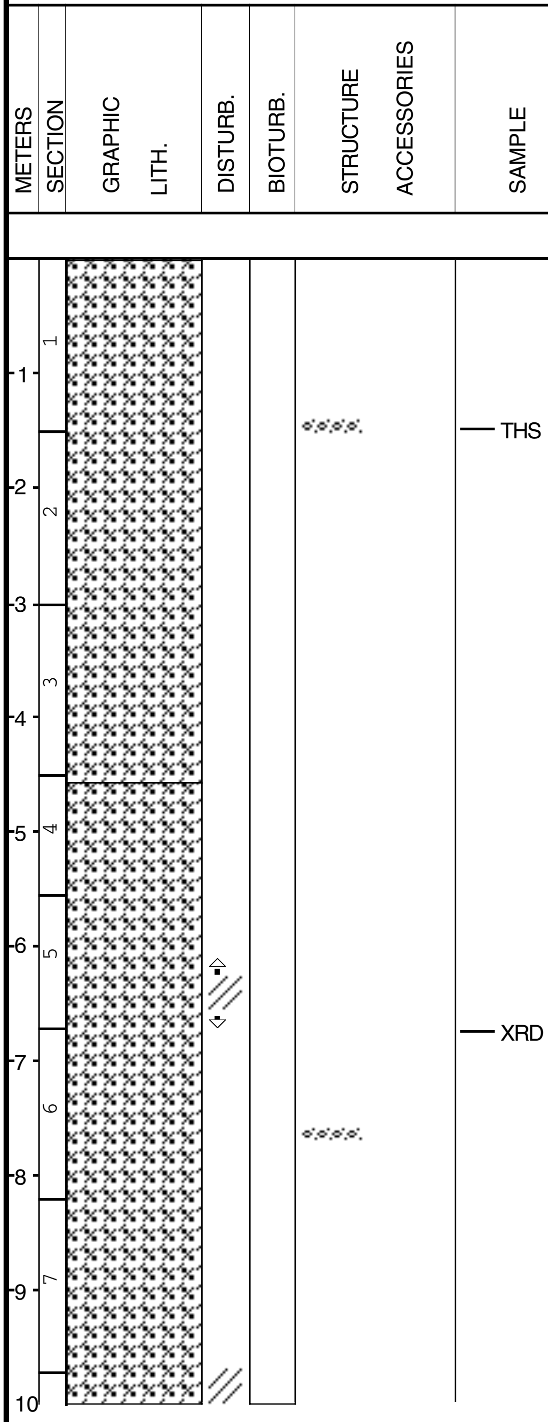
LITHIC VITRIC TUFF is gray (N4), occurs from the top of Section 1 to Section 2, 97 cm, and is composed of medium sand-sized ash with lithic lapilli. The bed is massive except for isolated laminae of coarse ash in Section 1, 90-129 cm and Section 2, 55-60 cm. LITHIC VITRIC LAPILLI-TUFF, dark greenish gray (10Y 4/1) to light gray (N6), is present from Section 2, 97 cm to Section 7, 135 cm. This interval is composed of very coarse sand-sized ash with pebble-size lapilli. Fabric ranges from massive to weakly bedded, with subhorizontal layering poorly defined by layers of lapilli, subhorizontal alignment of elongate grains, and gradual changes in grain size. In section 7, these changes suggest three reversely graded sequences. Color changes sharply from dark greenish gray (10Y 4/1) to light gray (N6) in Section 5 at 25 cm.

Components are 20% glass shards, 30% lithics, and ~50% matrix. Glass shards are subangular to subrounded and subelongate to subequant, and range in size from <1 to 4 mm. Unaltered glass is found at the top of Section 1 and in Sections 5 through 7. Lithics are ≤10 mm, and are mainly angular to subangular and subequant. The predominant lithics are aphanitic, gray, and nonvesicular to sparsely vesicular. The matrix is composed of fine glass shards, lithic ash, and other intergranular material with white cement. Accretionary lapilli are sparse (<1%) to absent.

sample for alteration studies

Core Photo

Site 1184 Hole A Core 42R Cored 490.7-500.3 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

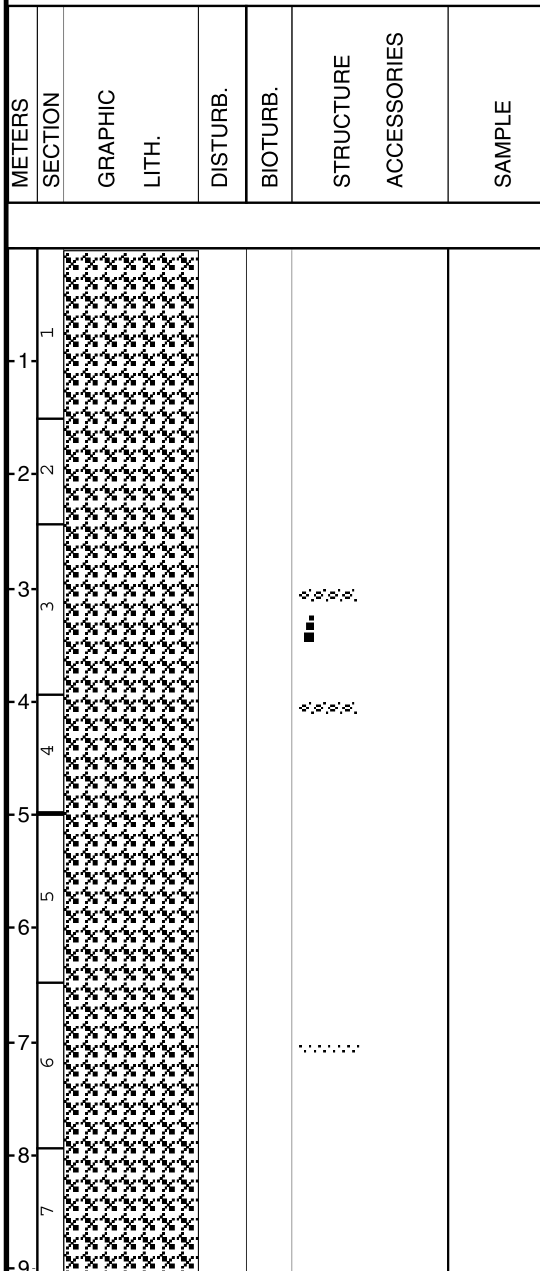
AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF is light greenish gray (5G 6/1) to gray (N4), massive, poorly sorted, and composed of fine to medium sand-sized ash with <5% lapilli. Coarse grains are angular to subrounded. Grain size varies gradually on a 50-cm scale through the core with no apparent trends to coarser or finer material. In Section 3, 110-145 cm and Section 6, 55-70 cm and 90 cm there is a subhorizontal fabric defined by grain-size changes and aligned grains. Reddish zones are present in Section 3, 72-75 cm and 86-88 cm. Rare accretionary lapilli are present in Section 7. A white vein is present in Section 4, 55-59 cm.

Core Photo

Site 1184 Hole A Core 43R Cored 500.3-509.9 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

Major Lithology:

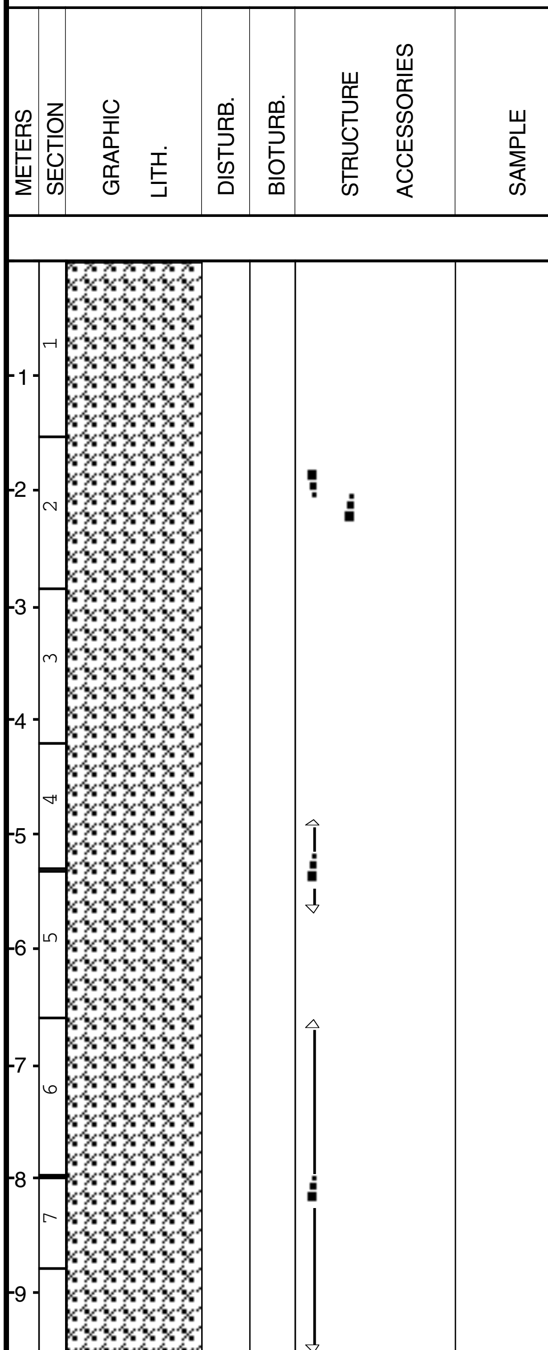
LITHIC VITRIC TUFF, gray (N4) to dark greenish gray (10Y 3/1) is fine- to medium-grained, massive, and moderately to poorly sorted, with 5-10% granule-sized lithic lapilli and accretionary lapilli. Reddish brown (2.5YR 5/4) intervals are present in Section 4, 42—51 cm and Section 7, 83—90 cm. The top of the lower reddish interval coincides with a sharp upward decrease in grain size. Average grain size oscillates throughout the core, and the interval in Section 3, 90—110 cm is normally graded. Thin white veins of variable orientation are spaced at approximately 30-cm intervals in Sections 1 through 3. Accretionary lapilli are more abundant within finer-grained TUFF in Section 3, 0—50 cm and 76—95 cm.

The fine-grained LITHIC VITRIC TUFF from top of Section 1 to Section 7, 83 cm consists of 5-10% altered glass shards, 5-10% lithics, <1-5% accretionary and armored lapilli and 75-90% matrix. There is an altered glass-rich band in the sediment at Section 2, 45-54 cm. Glass shards have been mostly or completely altered to black clay or gray-green clay. Most glass shards are subangular and subequant. The altered glass shards range in size from <1 to 1.5 mm. Pinkish, moderately vesicular lithics are dominant, with subordinate amounts of plagioclase-rich lapilli, fine dolerite, scattered rip-up clasts and possible zeolites making up the remaining fraction. As a whole, lithics are subequant to subelongate, and mainly subangular. Accretionary lapilli are sparse and fragmented throughout Section 1, and increase in abundance in Section 2 to about 3% and again in Section 3 to about 5%. The accretionary lapilli are in moderate abundance around Section 4, 10 cm, then sparse until Section 7, 66 to 83 cm. Armored lapilli are present in Section 5, 53 cm and 84 cm, and in Section 6, 30 cm and 74 cm. The matrix is silt-sized and granular, dominating most of Core 43R.

The coarse-grained LITHIC VITRIC TUFF in Section 7, 83-114 cm consists of 15-20% altered glass shards, 20-25% lithics, <1%accretionary and armored lapilli and 55—60% matrix. The interiors ofaltered glass lapilli range from dull blue clay to vitreous black glass;these are both rimmed with black alteration clay. The maximumdiameter of the glass shards is 2 mm, with the smaller shardsgenerally altered whereas the larger ones are relatively fresh. Theshards are angular to subrounded; the smaller shards are elongateand the larger ones are subequant. A few have smooth, roundvesicles. The lithic lapilli are ≤4 mm, angular to subrounded, andhave variable sphericity. There are 3 major types recognized:pinkish brown to gray basaltic fragments that range from dense,nonvesicular, aphanitic and aphyric to sparsely-phyric andsparsely-vesicular; white and lighter-colored pumiceous orsparsely-phyric lapilli; and brown to earthy-brown, subangulartuffaceous lapilli with visible glass and microlites. A few (<1%)accretionary and armored lapilli are present; the maximum diameteris 3 mm. Most are subround and equant, and have tuffaceousinteriors with reddish armor or accreted zones. The matrix consistsmostly of fine-grained ash and altered glass.

Core Photo

Site 1184 Hole A Core 44R Cored 509.9-519.5 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

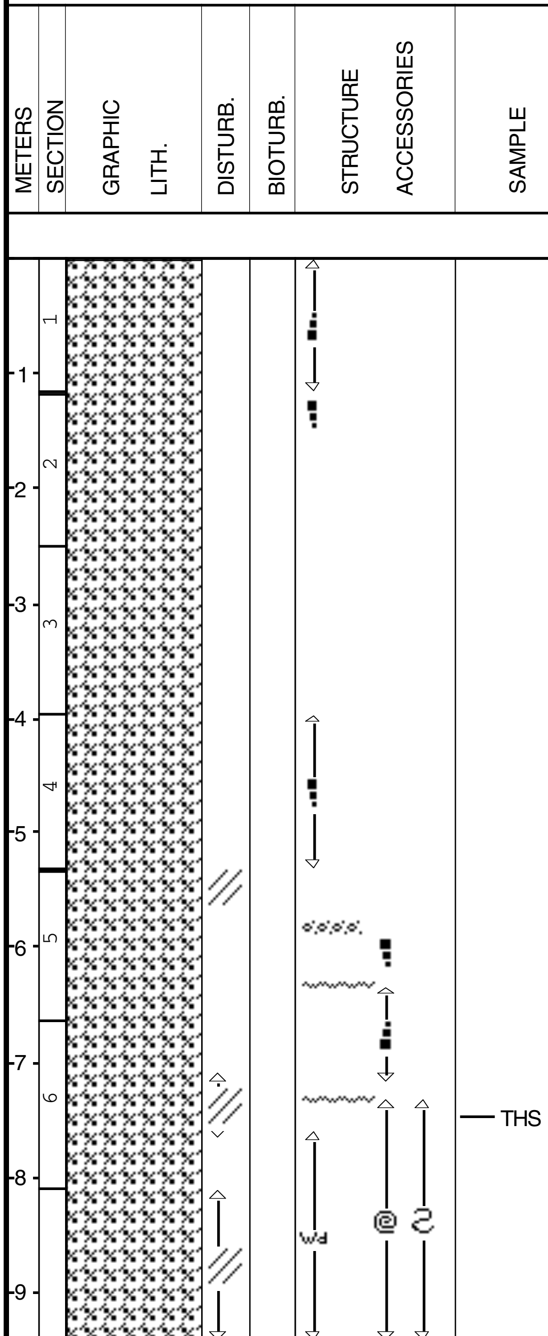
Major Lithology:

LITHIC VITRIC TUFF is dark greenish gray (10Y 3/1) to gray (N4), fine- to coarse-grained, massive, and very poorly sorted. There are 10-15% granule- to fine-pebble-sized lithic lapilli, and a few small accretionary lapilli. Subtle fining- or coarsening-upward trends are due to variable abundance of lithic lapilli and minor changes in matrix texture, but there are no bedding breaks or obvious sedimentary structures. There is a subtle fining-upward trend spanning Sections 6 through 8.

The LITHIC VITRIC TUFF consists of 10-30% glass shards, 10-40% lithics, rare accretionary and armored lapilli, and 30-80% matrix. Section 4 has the lowest concentration of lapilli. Glass shards are dull blue to vitreous black and coated with black alteration clay. Smaller shards are typically altered to clay, but larger ones generally have fresher interiors; the largest shard is about 6 mm in diameter. The shards are angular to subrounded, but are mainly subangular; large shards are subequant and small ones are subelongate. A few of the glass shards are vesicular and others are sparsely phyric. Lithics range from <1 to 13 mm, are angular to subrounded, but mainly subangular, and the majority are subelongate. The major lithic type is pinkish-gray basalt, which is mainly nonvesicular and aphyric. Less abundant sparsely phyric and sparsely vesicular basalt have vesicles filled with chalcedony. The next major lithic lapilli type is whitish (with various shades of other colors) and mainly pumiceous in texture although aphanitic and nonvesicular types also occur. A few earthy-brown tuffaceous lapilli, consisting of glass and microlites are also present. Rare accretionary and armored lapilli, ≤2.5 mm, are present. The matrix consists mostly of fine glass shards and lithic ash.

Core Photo

Site 1184 Hole A Core 45R Cored 519.5-529.2 mbsf



DESCRIPTION

LITHIC VITRIC TUFF

AGE: middle Eocene

Major Lithology:

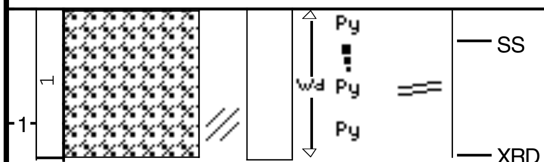
LITHIC VITRIC TUFF is dark greenish gray (10Y 3/1) to gray (N4), and very poorly sorted, with grain size varying from fine to coarse sand. Sections 1 through 3 contain 10-15% granule- to pebble-sized lithic lapilli, forming the coarse basal portion of the subtle fining-upward trend through the overlying Core 44R. Section 4 through Section 6, 70 cm contain 5% granule-sized lithic lapilli with a subtle coarsening-upward trend. Within these general trends are oscillations in average abundance of lithic lapilli and in matrix grain size. Thin, horizontal and vertical, white veins occur in Sections 1, 3 and 4. A slumped interval spanning Section 6, 70 cm through Section 7, 133 cm has several distorted layers of wood and organic matter, and contorted to vertical transitions between finer and coarser grained TUFF. The irregular upper boundary of the slump may be a scour contact.

The LITHIC VITRIC TUFF is composed of ≤30% altered glass shards, 20-30% lithics, scattered accretionary and armored lapilli, and 40-80% matrix. Glass shards and lithics are less abundant in fine-grained, moderately sorted layers. The glass shards are brownish green in the organic-rich layers at the bottom of Section 6 (~70 cm) and Section 7. They are white, dull blue and vitreous black with black rims in the rest of the core. The shards are angular to subrounded, but predominantly subangular, and ≤3 mm. Large shards have fresher interiors than smaller ones; a few are sparsely vesicular and sparsely phyric. Lithics are angular to subrounded, but predominantly subangular and subelongate. Lithics are dominated by pinkish gray basalt with vesicles filled with chalcedony. Light gray lithic lapilli have pumiceous texture and their vesicles are also filled with chalcedony; others are plagioclase-rich and contain rare pyrite. Accretionary and armored lapilli, ≤6 mm, are most abundant at the bottom of Section 6. Most are deformed to subrounded shapes and some are broken. The matrix consists mostly of fine glass shards and lithic ash.

Core Photo

Site 1184 Hole A Core 46R   Cored 529.2-538.8 mbsf

METERS | SECTION | GRAPHIC LITH. | DISTURB. | BIOTURB. | STRUCTURE | ACCESSORIES | SAMPLE | DESCRIPTION



LITHIC VITRIC TUFF

AGE: middle Eocene

Major Lithology:

LITHIC VITRIC TUFF is dark greenish gray (10Y 3/1) to light gray (N7), and moderately to poorly sorted, with organic carbon-rich intervals and pieces of wood throughout the core. Two thin silt layers in Section 1, 27–30 cm are rich in glass shards. Section 1, 60–78 cm is composed of inclined parallel beds of moderately sorted, coarse to medium sand-sized ash. Two reversely graded beds span Section 1, 32–50 cm and 50–62 cm.

Site 1184 Smear Slides

Site	Hole	Core	Type	Section	Top (cm)	Depth (mbsf)	Lithology	T - Sand	T - Silt	T - Clay	M - Biotite	M - Calcite	M - Carbonate	M - Clay	M - Feldspar	M - Glauconite	M - Opaques	M - Plagioclase	M - Pyrite	M - Pyroxene	M - Quartz	M - Unspecified Minerals	M - Volcanic Glass	M - Zeolite	B - Diatoms	B - Ebridians	B - Foraminifers	B - Nannofossils	B - Radiolarians	B - Siliceous Sponge Spicules	B - Silicoflagellates	B - Sponge Spicules	B - organic debris	R - Lithic Fragments	Comments
1184	A	2	R	1	75	135.15	D	40	40	20															1		45	45	5	2	2				
1184	A	2	R	3	50	137.9	D	50	40	10																	50	37	5	5	3				
1184	A	2	R	3	36	137.76	D	50	40	10																	50	37	5	6	2				
1184	A	2	R	3	48	137.88	D	40	40	20																	45	50	2	3					
1184	A	3	R	2	101	146.51	D	30	5	65															1		30	53	1	15					
1184	A	4	R	6	63	161.83	D	10	40	50																	15	80							
1184	A	4	R	2	16	155.36	M	30	20	50																	40	50	5	4	1				maybe 2 glass pieces
1184	A	4	R	6	63	161.83	D	10	40	50																			3	2					
1184	A	5	R	1	4	163.34	M	15	40	45																	15								
1184	A	5	R	3	95	167.25	M	10	40	50													1				10	85	2	2					
1184	A	5	R	3	72	167.02	D	15	45	40																				2					
1184	A	5	R	1	4	163.34	M	15	40	45													5					75							
1184	A	5	R	3	72	167.02	D	15	45	40																	20	75	3						
1184	A	5	R	1	4	163.34	M	15	40	45																			4	1					
1184	A	6	R	3	50	176.4	D	10	10	80		5											10				13	68	2	2					clay sized fragments possibly micas
1184	A	6	R	3	57	176.47	D	10	5	85		5										3					10	80	2						
1184	A	7	R	2	150	185.5	M	15	50	35													10				15	65	6	4					
1184	A	7	R	6	65	190.65	D	15	12	73																	24	73	1	2					
1184	A	8	R	3	50	195.3	D	25	20	55																	44	55		1					
1184	A	9	R	1	120	202.3	D	50	35	15		35										25	15	24				1							
1184	A	27	R	5	29	351.87	M	30	70								10						70	20											
1184	A	31	R	1	15	384.55	M	20	70	10							30						60	10			0	0							
1184	A	31	R	1	89	385.29	D	30	60	10							30						65	5				0							
1184	A	46	R	1	27	529.47	M	0	30	70							49	1					20	30											

Site 1184 Volcaniclastic Thin Section Descriptions
For Proportions: "," represents same as, otherwise "<" and ">" are used

TS#	Thin section	Unit	Described by	Rock name	Lithic clasts	Vitric clasts	Discrete crystals	Accretionary or armored lapilli	Figure number or Photomicrograph ID#	Clast proportions	Comments
87	192-1184A-11R-3, 123-125	IIA	CRN, PRC, LMC, WJC, MG, JH	Coarse vitric lithic tuff	Basalt (vesicular, nonvesicular; aphyric > phyric)	Subround shards (nonvesicular >> vesicular)	Clinopyroxene > plagioclase, titanomagnetite > sulfide	None	See **Chapter 4, Figure F49, Figure F59** See photomicrographs **1184A-040, 1184A-051, 1184A-066**	Lithic 55%, vitric 30%, discrete crystals 1%, matrix 14%	Some basalt clasts contain plagioclase replaced by zeolite. Glass is altered to smectite and replaced by zeolite in places. Many apparent fragments could be tachylite. The matrix is fine ash altered to zeolite, smectite and minor calcite. Discrete crystals are unaltered and fragmental. Titanomagnetite is partially altered to maghemite.
88	192-1184A-12R-4, 8-11	IIA	CRN, LMC, PRC, RVW, JH	Highly altered lithic vitric tuff (boundary between green-brown color change)	Basalt (nonvesicular, aphanitic)	Subround shards (nonvesicular >> vesicular)	Clinopyroxene > titanomagnetite	None		Lithic 5%, vitric 70%, discrete crystals 1%, matrix 24%	Glass is completely altered to smectite; several glass clasts appear to be devitrified and occasionally replaced by zeolite. The matrix is fine ash altered to smectite and zeolite with <1% calcite. Rare tachylite clasts are present. Clinopyroxene is unaltered and fragmental. Titanomagnetite is partially altered to maghemite. Finely disseminated sulfide blebs (<0.005 mm) are present in the matrix.
89	192-1184A-16R-CC, 7-10	IIB	CRN, PRC, RVW, LMC, JH	Highly altered lithic vitric tuff	Basalt (vesicular >> nonvesicular; aphyric > phyric)	Blocky glass (vesicular > nonvesicular)	Clinopyroxene, plagioclase > titanomagnetite > sulfide	None	See **Chapter 4, Figure F35, Figure F61, Figure F62, Figure F63** See photomicrographs **1184A-042, 1184A-044, 1184A-045, 1184A-046, 1184A-047, 1184A-048, 1184A-049, 1184A-050, 1184A-052, 1184A-053, 1184A-054, 1184A-063, 1184A-064**	Lithic 35%, vitric 50%, discrete crystals 1%, matrix 15%	Scoriaceous basalt fragments and rare phenocrysts of clinopyroxene and plagioclase are present. Highly vesicular clasts contain smaller clasts of nonvesicular, aphyric basalt. Lithic clasts have altered rims. Glass is completely altered to smectite and replaced by zeolite or celadonite in places. One tachylite clast is observed. Titanomagnetite is partially replaced by maghemite. Pyrite seen in the matrix and occasionally rims vesicles in clasts. The matrix is primarily composed of fine ash altered to zeolites and smectite. Vesicles in the scoriaceous basalt fragments are generally filled by zeolite.
90	192-1184A-17R-3, 64-67	IIB	PRC, CRN, LMC, SPI	Vitric lithic lapilli-tuff	Reworked vitric lithic lapilli-tuff (highly altered, consisting mainly of poorly preserved lithics and glass); scoriaceous basalt;	Angular shards have less altered cores; subround shards are completely altered	Titanomagnetite/ maghemite > plagioclase > clinopyroxene	A few armored lapilli with glass nucleii.		Lithic 50%, vitric 20%, discrete crystals 5%, matrix 20%, cement 5%	This section is made up chiefly of reworked clasts of highly altered vitric lithic lapilli-tuff enclosed in a slightly less altered (judging from the appearance of the glass shards) vitric lithic lapilli-tuff. The reworked clast consists of scoriaceous basalt, large grains of titanomagnetite, highly altered glass, lithic fragments, and rare, small plagioclase and clinopyroxene crystals. The clast is mantled by a thin layer of ash. The host material has a higher abundance of less altered glass shards and larger discrete crystals of plagioclase and clinopyroxene, but a lower abundance of titanomagnetite. Titanomagnetite composes ~3% of the rock; it is concentrated mainly in the reworked clast. Matrix is fine ash altered to smectite. Zeolite, particularly analcime, forms the cement.

Site 1184 Volcaniclastic Thin Section Descriptions

For Proportions: "," represents same as, otherwise "<" and ">" are used

TS#	Thin section	Unit	Described by	Rock name	Lithic clasts	Vitric clasts	Discrete crystals	Accretionary or armored lapilli	Figure number or Photomicrograph ID#	Clast proportions	Comments
91	192-1184A-17R-3, 71-74	IIB	CRN, PRC, LMC, JH, TS	Highly altered vitric lithic tuff	Basaltic (vesicular > nonvesicular; aphyric >> phyric)	Angular shards have fresher cores (nonvesicular >> vesicular); subround shards are completely altered	Plagioclase > clinopyroxene >> titanomagnetite >> sulfide	None		Lithic 50%, vitric 35%, discrete crystals 1%, matrix 15%	Vesicular lithic fragments are commonly scoriaceous and contain smaller clasts of nonvesicular, aphyric basalt. Lithic clasts have a quenched rim. Glass is completely altered to smectite and locally replaced by zeolite. Most discrete plagioclase crystals are replaced by zeolite, although rare, fresh plagioclase also occur. Some discrete plagioclase crystals are zoned. Vesicles are usually filled with zeolite. Titanomagnetite is partially altered to maghemite. Sulfide is present as micron-sized blebs in matrix. One clast contains a relatively high proportion (>2%) of titanomagnetite only slightly altered to maghemite. Fine ash altered to smectite forms the matrix.
92	192-1184A-18R-6, 43-45	IIB	MG, CRN, LMC	Lithic vitric tuff	Basalt (fine-grained; gray) > reworked clasts of lithic vitric tuff	Subround nonvesicular shards (altered)	Plagioclase > clinopyroxene > titanomagnetite	None		Lithic 25%, vitric 45%, discrete crystals ~1%, matrix 19%, cement 10%	This fine-grained lithic vitric tuff is composed mainly of glass altered to smectite. Some reworked clasts of lithic vitric tuff are present. They range in size from 0.5 to 1.2 mm, and appear to be broken-up pieces of the host rock. Some lithic clasts within the reworked clasts have oxidation rims. Smectite has replaced the fine ash in the matrix. Zeolite fills a vein and forms the cement.
93	192-1184A-20R-3, 34-37	IIB	CRN, RVW, PRC, JH, TS	Coarse lithic vitric tuff	Basalt (vesicular > nonvesicular; aphyric > phyric; aphanitic > fine grained)	Subround shards (vesicular, nonvesicular)	Clinopyroxene >> plagioclase, titanomagnetite	None	See **Chapter 4**, **Figure F40**, **Figure F41** See photomicrographs **1184A-067**, **1184A-068**	Lithic 30%, vitric 50%, discrete crystals 1%, matrix 19%	Clinopyroxene and rare plagioclase phenocrysts are present in the aphanitic basalt clasts; plagioclase is replaced by zeolite. One diabase clast is present and contains unaltered clinopyroxene plagioclase replaced by zeolite. One fine-grained intersertal basalt clast is present. Vesicles are filled with zeolite. Rare discrete plagioclase crystals are zoned. Titanomagnetite is altered to maghemite. Glass is altered to smectite and is partially replaced by zeolite. One possible tachylite clast is present. The matrix is fine ash predominantly replaced by zeolite, calcite, and smectite. Pyrite is present in the matrix and in filled vesicles.
94	192-1184A-20R-5, 41-44	IIB	CRN, MG, LMC, JH, WJC, RVW, TS	Altered coarse vitric lithic tuff	Basalt (vesicular > nonvesicular; phyric > aphyric; fine grained > aphanitic)	Subangular shards (nonvesicular > vesicular)	Clinopyroxene > plagioclase, titanomagnetite >> sulfide	None	See **Chapter 4**, **Figure F36**, **Figure F37** See photomicrographs **1184A-055**, **1184A-056**, **1184A-057**	Lithic 45%, vitric 25%, discrete crystals 2%, matrix 18%, cement 10%	Contains a large diabase clast with subophitic texture. Discrete crystals of unaltered plagioclase and twinned clinopyroxene are present. Titanomagnetite is partially to totally altered to maghemite. Glass is altered to smectite and partially replaced by zeolite. The matrix is fine ash predominantly replaced by zeolite and smectite, with rare sulfide. The cement is composed of calcite.
95	192-1184A-21R-2, 92-94	IIB	PRC, CRN, LMC	Lithic vitric lapilli-tuff	Basalt (scoriaceous > nonvesicular > sparsely phyric); light colored with abundant opaque minerals.	Blocky glass (aphyric, nonvesicular > vesicular > sparsely phyric). Some show concentric alteration with lighter-colored centers.	Clinopyroxene > plagioclase > Fe-oxyhydroxide > titanomagnetite >> sulfide	None	See **Chapter 4**, **Figure F64**, **Figure F65**, **Figure F66**	Lithics 35%, vitrics 50%, discrete crystals ~2%, matrix 13%	This section was taken near a calcite vein; a greenish halo parallels the vein. In the halo, almost all primary material is altered to green smectite. Outside the halo, primary phases are altered to brown smectite which also replaces the fine ash of the matrix. Minor maghemite is present in altered glass. Rare tachylite clasts are present.

Site 1184 Volcaniclastic Thin Section Descriptions

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TS#	Thin section	Unit	Described by	Rock name	Lithic clasts	Vitric clasts	Discrete crystals	Accretionary or armored lapilli	Figure number or Photomicrograph ID#	Clast proportions	Comments
96	192-1184A-22R-CC, 9-13	IIC	WJC, CRN, TS, LMC, PRC, SPI	Tachylite-rich lapillistone	Basalt (scoriaceous > nonvesicular > sparsely phyric).	Tachylite (non-vesicular > vesicular; sparsely phyric > aphyric); trachytic texture	Clinopyroxene	None	See **Chapter 4**, **Figure F52**, **Figure F53**, **Figure F54** See photomicrograph **1184A-075**	Vitric 95%, cement 5%	This tachylite-rich lapillistone shows a trachytic texture. This flow texture crosscuts some relict grain boundaries and excludes other quenched clasts. The altered lithics contain larger crystals than the tachylite. Very small crystals (<0.0005 mm) of titanomagnetite and/or maghemite are disseminated throughout the now devitrified and altered glass, accounting for the overall opacity of the slide. Zeolite present throughout the thin section replaces some plagioclase microlites and forms cement between grains. Smectite replaces the glass and clinopyroxene.
97	192-1184A-31R-1, 141-142	IID	MG, WJC, LMC, CRN, TS	Lithic vitric tuff	Basalt (dark fine grained > fine-grained Fe-Ti basalt)	Angular, nonvesicular, altered and devitrified shards >> subround altered vesicular glass shards	Clinopyroxene > plagioclase > titanomagnetite	Ash-sized accretionary and armored lapilli present		Lithic 10%, vitric 40%, discrete crystals ~1%, cement 15%, matrix 34%	This highly altered fine-grained tuff contains several small (<2 mm) accretionary and armored lapilli. Zeolite forms the cement and the fine ash of the matrix has been replaced by smectite.
98	192-1184A-31R-6, 80-84	IID	RVW, LMC, TS, CRN	Lithic vitric tuff	Nonvesicular basalt > fine-grained tuff > diabase	Tachylite (vesicular > nonvesicular) > angular shards (nonvesicular >> vesicular)	Clinopyroxene > plagioclase > titanomagnetite	None		Lithic 35%, vitric 45%, discrete crystals 2%, matrix 13%, cement 5%	Layering in this thin section is caused by grain-size variations. Zeolite forms the cement and the fine ash matrix has been altered to smectite. Glass is replaced by brown smectite (and, rarely, red-brown Fe-oxyhydroxide). Maghemite has replaced titanomagnetite. Elongate clasts are aligned.
99	192-1184A-31R-7, 40-43	IID	PRC, LMC, TS, CRN, SPI	Highly altered fine to medium vitric lithic tuff	Basalt (nonvesicular > vesicular; sparsely phyric > aphyric; some show glomerophyric texture); reworked clasts; Fe-Ti basalt	Angular to subangular, nonvesicular shards > blocky vesicular shards; aphyric >> sparsely phyric; some show trachytic texture	Plagioclase > clinopyroxene >> titanomagnetite, sulfide	None	See **Chapter 4**, **Figure F29**, **Figure F32**, **Figure F39**, **Figure F51**	Lithic 45%, vitric 35%, discrete crystals 1%, matrix 19%	This sample was taken from a fine-grained layer we analyzed by ICP-AES. Most lithics appear to be ordinary basalt but a few plagioclase-titanomagnetite-rich fragments may be more fractionated Fe-Ti basalt; several vesicular lithics contain plagioclase and clinopyroxene phenocrysts. Some reworked clasts are also present. Plagioclase is up to 0.85 mm and clinopyroxene is up to 0.5 mm. Some plagioclase is altered to smectite. The fine ash matrix has been altered to analcime and smectite.
100	192-1184A-36R-7, 74-76	IIE	MG, PRC, CRN, SPI	Highly altered fine vitric lithic tuff	Basalt (nonvesicular; dark gray)	Angular, nonvesicular shards (altered)	Plagioclase > clinopyroxene >> pyrite > titanomagnetite	Several accretionary lapilli (>2 mm) are observed as faint outlines.		Lithic 35%, vitric 25%, discrete crystals 1%, matrix 39%	The thin section is traversed by several veins filled with zeolite. The matrix is fine ash altered to smectite. Clasts are fairly well-sorted (maximum clast size is 1.7 mm). The largest fragment is an accretionary lapillus (2.8 mm). Finely disseminated pyrite is present in the matrix. This sample was also analyzed by ICP-AES.
101	192-1184A-38R-1, 80-82	IIE	MG, PRC, CRN	Altered fine to medium vitric lithic tuff	Altered basalt (nonvesicular >> vesicular) > diabase	Angular, nonvesicular shards (altered)	Plagioclase > clinopyroxene >> titanomagnetite	None		Lithic 45%, vitric 30%, discrete crystals <<1%, matrix 25%	This sample contains slightly to highly altered glass shards and unaltered discrete crystals of plagioclase and clinopyroxene. The slightly altered glass is fractured. One large clinopyroxene (0.65 mm) contains partially devitrified glass inclusions. The fine ash of the original matrix has been replaced by smectite and zeolite.

Site 1184 Volcaniclastic Thin Section Descriptions

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TS#	Thin section	Unit	Described by	Rock name	Lithic clasts	Vitric clasts	Discrete crystals	Accretionary or armored lapilli	Figure number or Photomicrograph ID#	Clast proportions	Comments
102	192-1184A-40R-3, 37-41	IIE	WJC, PRC, TS, CRN, LMC	Highly altered fine to medium vitric lithic tuff	Altered basalt (nonvesicular > vesicular) > unaltered basalt (nonvesicular) > diabase	Blocky altered shards (nonvesicular, vesicular); a few shards are sparsely phyric	Plagioclase > clinopyroxene >> titanomagnetite >> sulfide	Rare armored lapilli and ash-sized accretionary lapilli	See **Chapter 4**, **Figure F31**, **Figure F47** See photomicrograph **1184A-089**	Lithic 50%, vitric 30%, matrix 20% (accretionary and armored lapilli < 1% ; discrete crystals << 1%)	The lithic fragments are mainly basaltic and most are highly altered, but a few are relatively unaltered. Plagioclase and clinopyroxene are present in the matrix and in the basalt clasts. A few titanomagnetite grains are altered to maghemite. Smectite, analcime and other zeolites have replaced the original fine ash of the matrix. This sample was also analyzed by ICP-AES.
103	192-1184A-41R-3, 29-33	IIE	PRC, TS, CRN, LMC	Altered fine- to medium vitric lithic tuff	Basalt (vesicular > non-vesicular; aphyric > phyric; some are glomerocrystic)	Most shards have been plucked out of the thin section; few present shards (nonvesicular > vesicular; aphyric >> phyric)	Plagioclase > clinopyroxene > titanomagnetite > Fe-oxyhydroxide > sulfide	None	See **Chapter 4**, **Figure F38**	Lithic 45%, vitric 35%, discrete crystals <<1%, matrix 15%, cement 5%	Most lithics are scoriaceous vesicular basalt. The largest clast is a Fe-Ti basalt with glomerocrystic elongated/skeletal plagioclase laths and anhedral clinopyroxene. Plagioclase and clinopyroxene crystals are present both in the matrix and basalt; plagioclase is up to 0.8 mm and clinopyroxene is up to 0.35 mm. Vesicles in altered glass are filled with zeolite. Smectite has replaced the fine ash in the matrix. The cement is composed of zeolite. A few discrete titanomagnetite crystals exhibit alteration to maghemite.
104	192-1184A-42R-1, 147-150	IIE	RVW, JGF, PRC, TS, CRN, LMC	Lithic vitric tuff	Altered basalt (aphanitic > holocrystalline; some are plagioclase-phyric; nonvesicular, vesicular). One rip-up clast with Fe-oxide coating.	Subangular shards; altered rims and unaltered interiors; nonvesicular >> vesicular	Clinopyroxene > plagioclase (~An80); one composite of pyroxene and plagioclase.	None	See **Chapter 4**, **Figure F33**, **Figure F48**, **Figure F50**, **Figure F60**, **Figure F67** See photomicrographs **1184A-084**, **1184A-085**, **1184A-088**	Lithic 25%, vitric 35%, discrete crystals <1%, matrix 40%	One glass clast contains microcrystalline plagioclase and clinopyroxene. Opaque minerals define a flow texture in another glass clast. Discrete plagioclase and clinopyroxene crystals (<0.4 mm), altered glass, rare pyrite and titanomagnetite are present in the matrix. Smectite has replaced the fine ash of the matrix. A few titanomagnetite crystals are altered to maghemite. This sample was also analyzed by ICP-AES.
105	192-1184A-45R-6, 82-85	IIE	PRC, LMC, CRN	Lithic vitric lapilli-tuff	Basalt (scoriaceous > dark fine grained > fine-grained Fe-Ti)	Unaltered, subround, nonvesicular shards > subangular, altered, vesicular shards > subround, altered, nonvesicular shards	Plagioclase > clinopyroxene > sulfide > titanomagnetite	Armored lapilli > accretionary lapilli and ash-sized accretionary lapilli	See **Chapter 4**, **Figure F46**, **Figure F68**, **Figure F69** See photomicrographs **1184A-153**, **1184A_156**, **1184A-157**	Lithic 10%, vitric 30%, discrete crystals ~1%, matrix 45%, accretionary lapilli 14%	This slide contains many unaltered, nonvesicular glass fragments. Few vesicular altered glass fragments are also visible. Most lithic clasts are scoriaceous basalts, but minor fine-grained basalts are also present. Smaller glass clasts are completely palagonitized. The matrix contains smectite and minor zeolite replacing the fine ash. Armored lapilli have nuclei of vesicular glass, scoriaceous basalt, fine-grained basalt and tuff fragments. Part of one large accretionary lapillus (~5 mm diameter) is present at the edge of the section.