



INL Lithologic Core Storage Library

Idaho National Laboratory
Building CFA-663

Operated by the U.S. Geological Survey
for the U.S. Department of Energy

Contact:
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Official Name: NRF-16

Logged By: M. K. V. Hodges

Selected Aliases: None

USGS Site ID: 434018112545101

Contractor Well ID: NA

Drilling Agency: USGS

Year Drilled: 2009

Names of Drillers: M. Gilbert and J. Blom

Well Status: Complete

Total Depth of Hole (ft): 425

Total Core Recovered (ft): 425

Beginning Depth (ft): 0

Ending Depth (ft): 425

Continuous Recovery

Selected Intervals Recovered

Notes:

County & State: Butte Co., Idaho

Quadrangle Name: Circular Butte 3 NW

Lat / Lng: N43 40 18.28 W112 54 51.40

Tns / Rng / Sec: T 04N R 30E 17

UTM Coordinates: 345675.036 4836979.066

Surface Elevation (ft): 4,827.54

Core Geological Profile

Lithologic Patterns

- Basalts
- Rhyolites
- Sedimentary Rock

Soil Patterns

(See Unified Soil Classification System.)

- Gravels - clean
- Sands with fines
- Gravels with fines
- Silts and clays
- Sands - clean

Intervals in Absentia

- Surficial material
- Interval not cored
- Natural void
- Missing interval

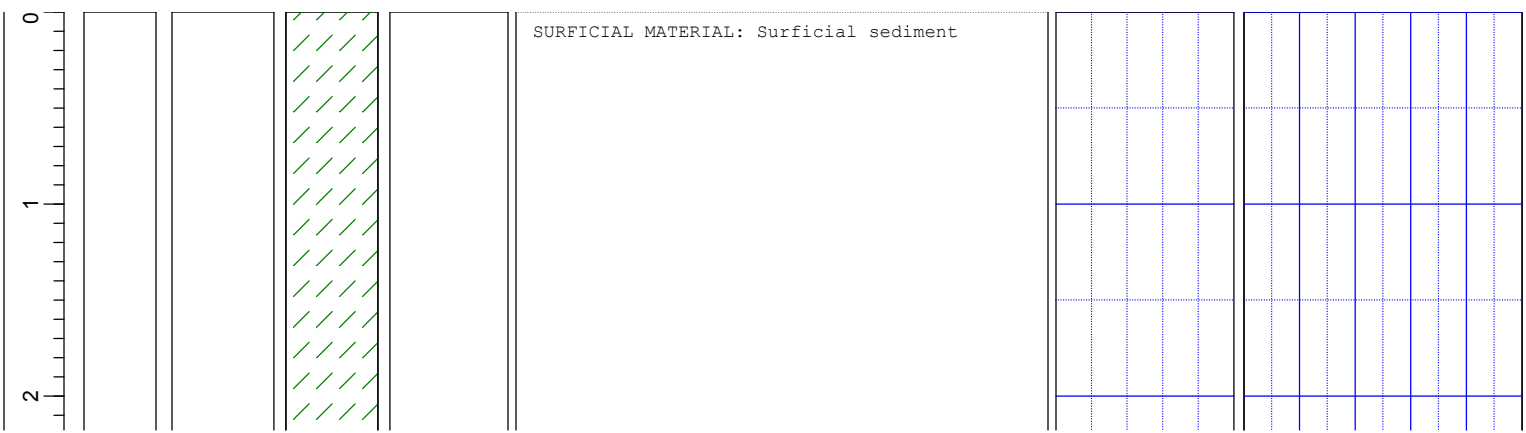
Igneous and Sedimentary Structure Symbols

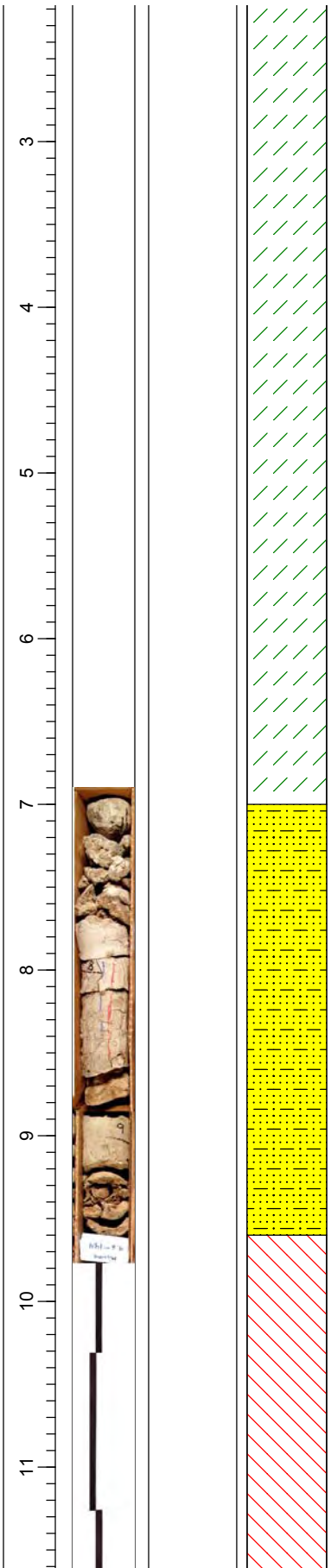
- | | | |
|-------------------|-----------------|--------------------|
| Vesicle zone | Pipe vesicles | Ripple marks |
| Large vesicles | Pillows | Mud cracks |
| Vesicle planes | Vesicle Sheet | Imbricated bedding |
| Mega vesicles | Flow/Mold | Graded bedding |
| Vesicle Cylinders | Spatter feature | Cross bedding |

Soil Structure Symbols

- Structureless - Single Grained
- Structureless - Massive
- Platy
- Granular
- Blocky
- Prismatic
- Columnar

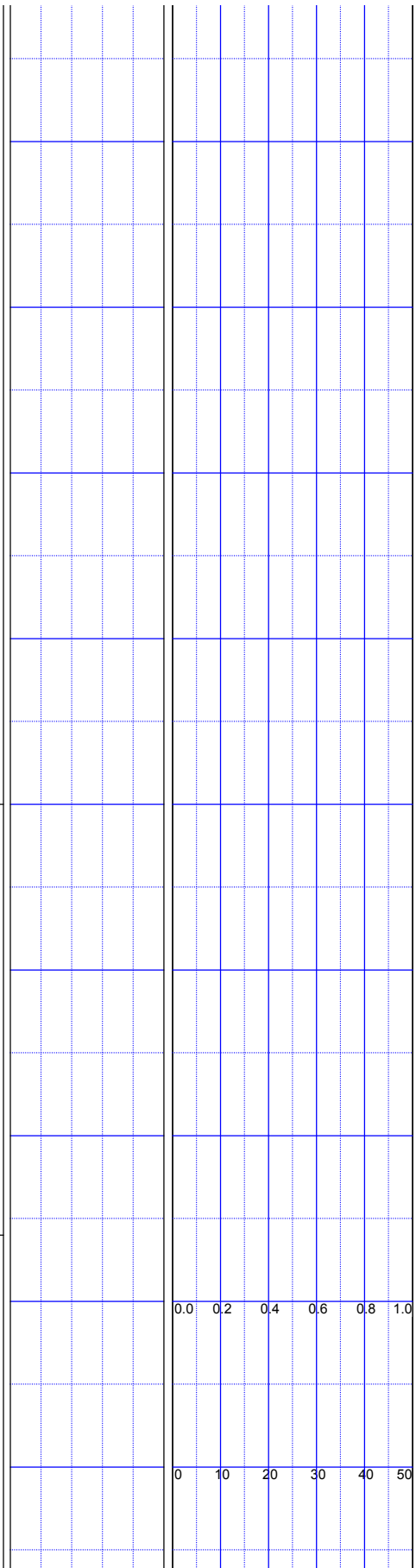
Depth (feet & tenths)	Core Photo	Igneous, Soil and Sed Structures	Lithology	Description		Fracture Frequency <small>(See fracture classification on website.)</small>	Vesicle Characteristics
				Miscellaneous Text	Lithologic Description	0 1 2 3 4 5	Mean Size (in) 0 0.2 0.4 0.6 0.8 1.0 Volume Percentage 0 10 20 30 40 50

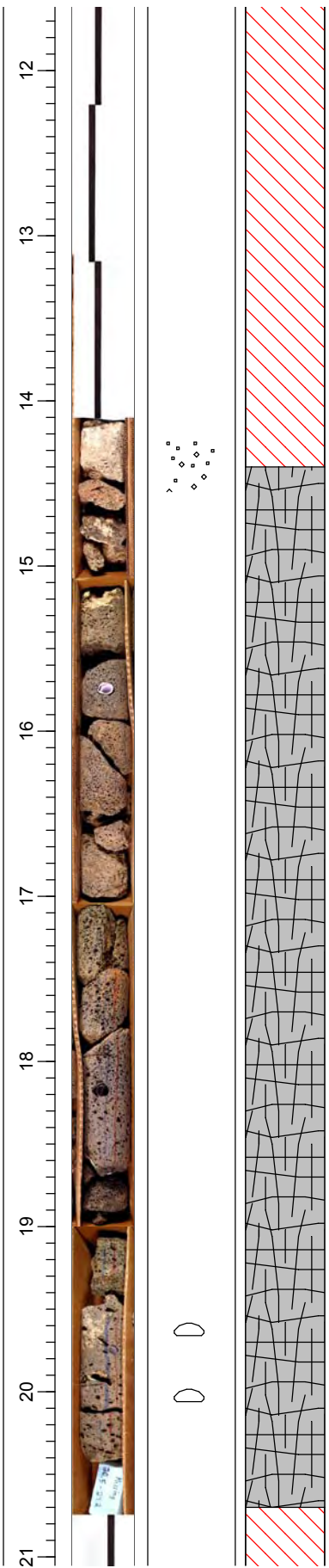




SANDS WITH FINES: TEXTURE: ML Sand with fines. Medium to fine grained, poorly sorted, lithic sand in a calcareous silt to clay matrix. Grains include rounded polished quartz grains, angular basalt fragments, angular to subangular black lithics, subrounded to subangular white and pink feldspar, and rounded to subrounded tan, gray, and cream quartzite grains
 COLOR: 10YR 6/2 Pale Yellowish Brown
 CONSISTENCY: Extremely firm
 STRUCTURE: Blocky
 FREE CARBONATES: Yes
 ROCK: Basalt fragments, including a 4 inch piece of basalt at top of interval
 ROOTS / FOSSILS: No

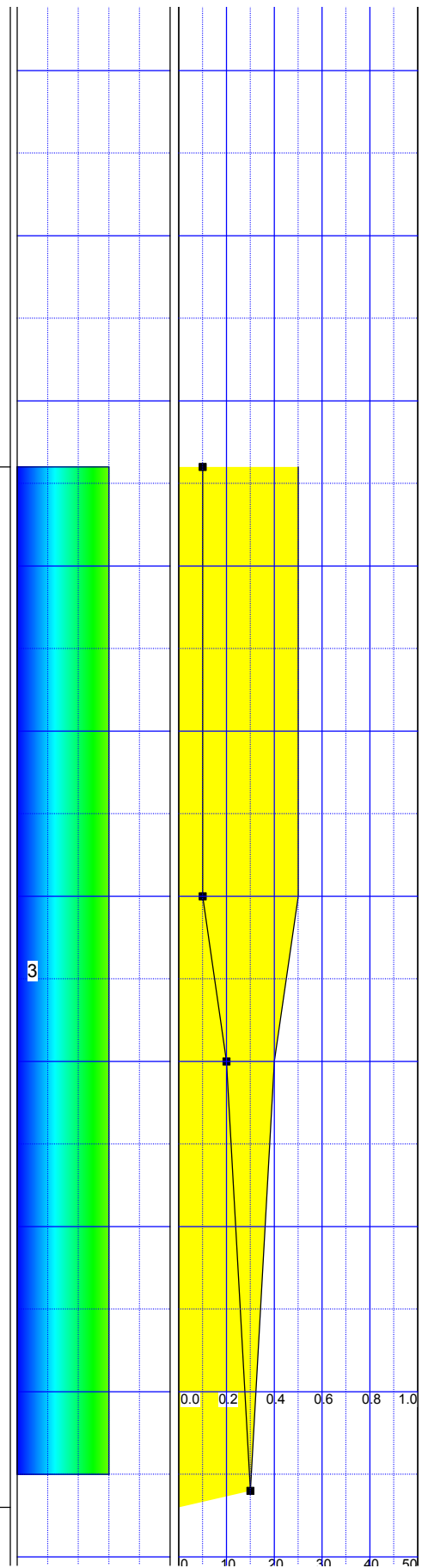
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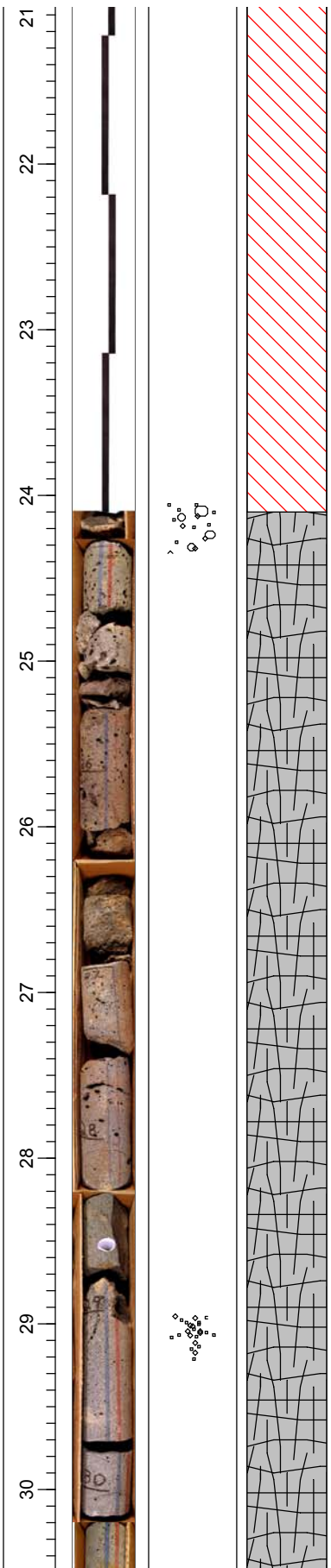




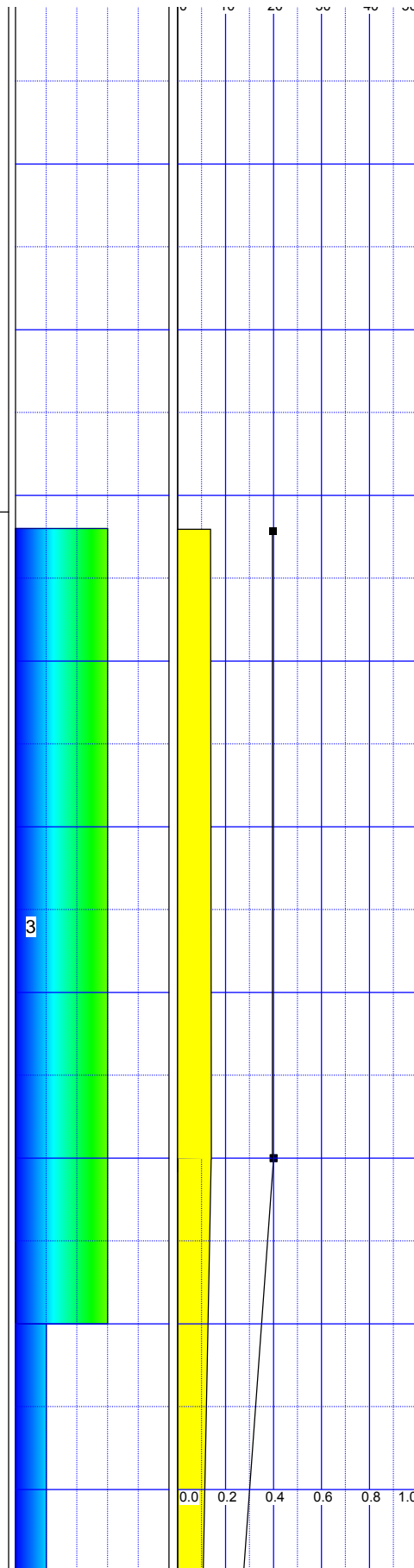
BASALT: COLOR: N5 Medium Gray grading to medium dark gray through interval. 5 YR 8/4 moderate orange pink to 5YR 5/2 sediment in vesicles and on fracture surfaces
 TEXTURE: Porphyritic, diktytaxitic, vesicular basalt. Scoriaceous with many very small vesicles at top, grading to diktytaxitic with megavesicles at base. Glassy groundmass at top, felty at base
 COMPOSITION: 5-10% subhedral 1 mm olivine phenocrysts in a felty plagioclase groundmass
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: None observed

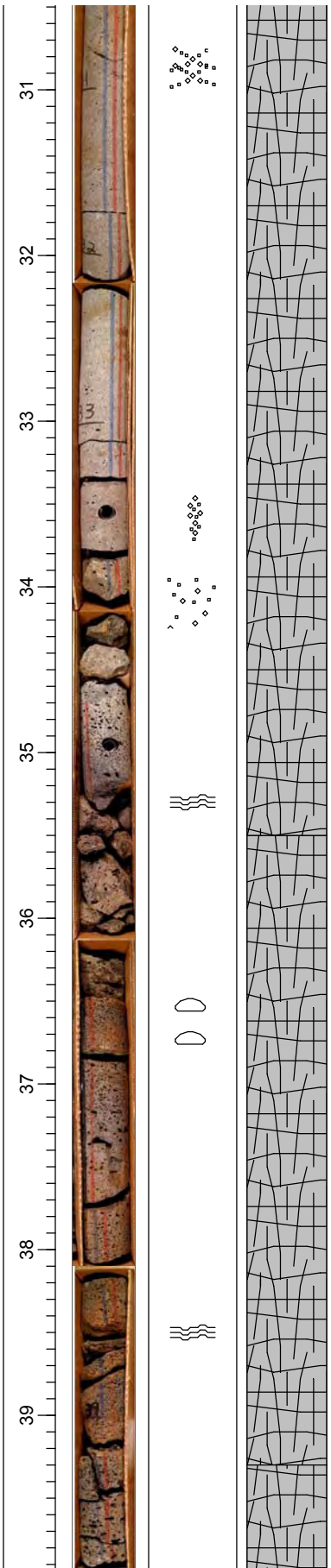
MISSING INTERVAL: Natural gamma log indicates sediment





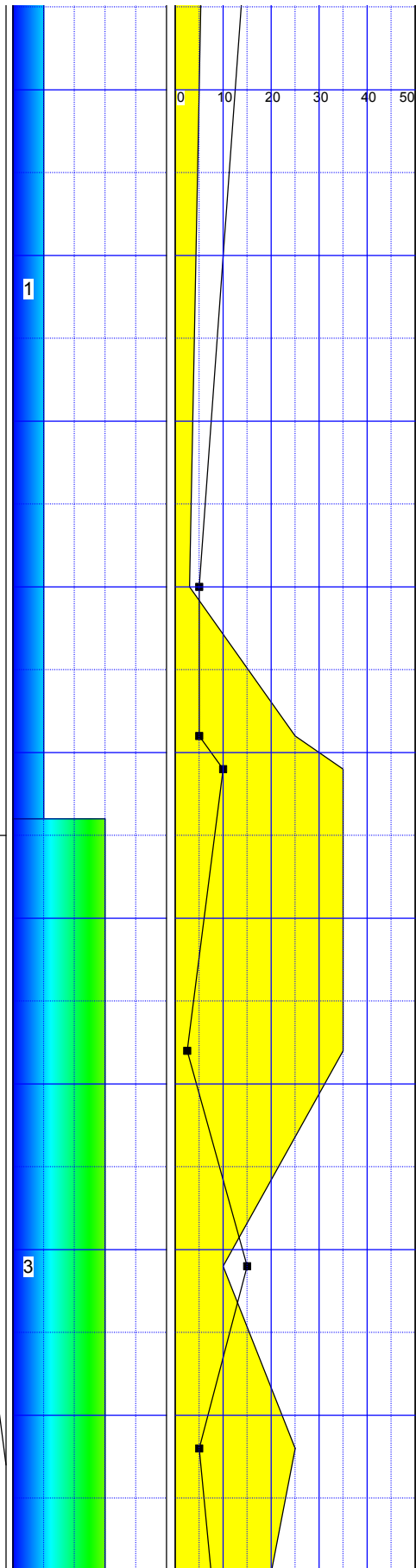
BASALT: COLOR: N4 Medium Dark Gray to 5YR 4/1 Brownish Gray at center of interval, N4 Dark Gray at base.
 TEXTURE: Aphanitic, porphyritic and very vesicular at top, diktytaxitic through middle of interval, with 1-2 mm euhedral to subhedral olivine phenocrysts in a diktytaxitic, felted plagioclase rich matrix, then vesicular and more aphanitic at base.
 COMPOSITION: 3 to 5% one to two mm olivine in felted plagioclase matrix
 XENOLITHS/AUTOLITHS: None observed
 ALTERATION: None observed

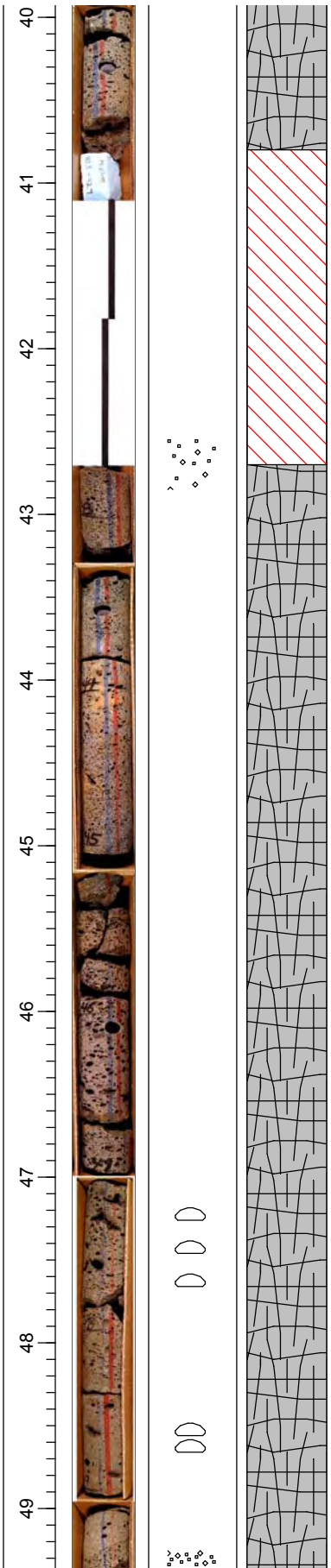




BASALT: COLOR: N5 medium gray at top, grading into N6 medium light gray through center of interval, N4 dark gray at base. 10YR 8/2 very pale orange sediment on fracture surfaces.
 TEXTURE: Aphanitic, porphyritic and very vesicular at top, diktytaxitic and vesicular through middle of interval, with < 1% 1 mm euhedral to subhedral olivine phenocrysts in a diktytaxitic, felted plagioclase rich matrix,. Vesicle size increases to 37.8 ft, vesicles increase in number and decrease in size to base. Vesicular and more aphanitic at base.
 COMPOSITION: 0.5 to 1% one mm olivine in felted plagioclase matrix
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Flow feature at base shows reddish staining.

BASALT: COLOR: N4 Medium dark gray at top, grading into N5 medium gray through center of interval, N5 medium dark gray at base.
 TEXTURE: Porphyritic and very vesicular at top, diktytaxitic and vesicular through middle of interval, with 1.5% 3 to 5 mm euhedral to subhedral olivine phenocrysts in a diktytaxitic, felted, plagioclase-rich matrix,. Vesicle size increases to 40.4 ft, vesicles increase in number and decrease in

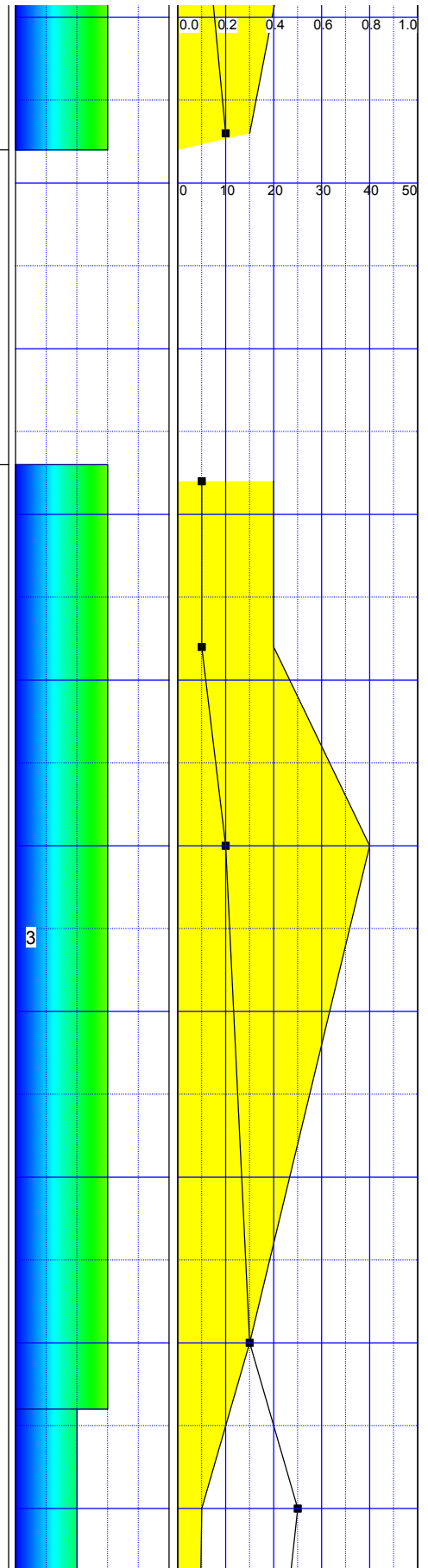


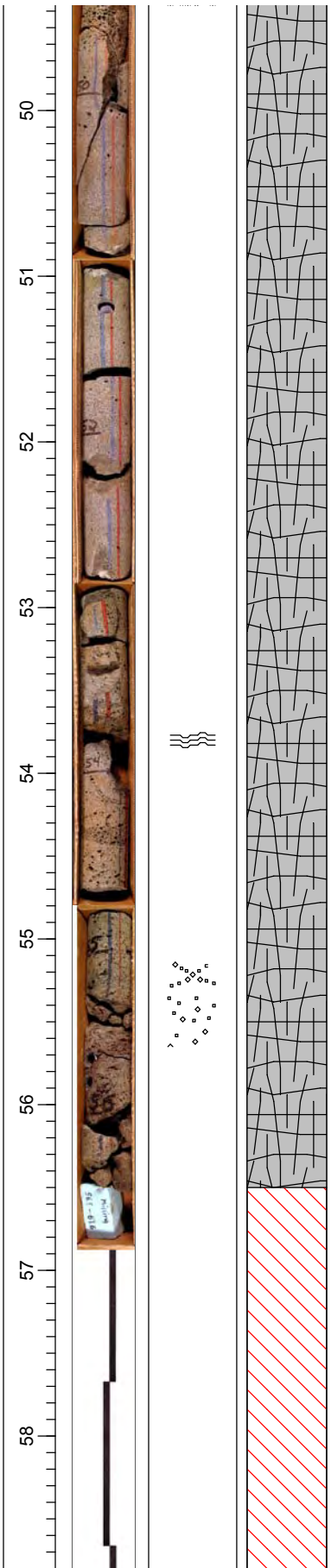


size to base. Vesicular and more aphanitic at base.
 COMPOSITION: 0.5 to 1% one mm olivine in felted plagioclase matrix
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Flow feature at base shows 5R 5/4 moderate red staining.

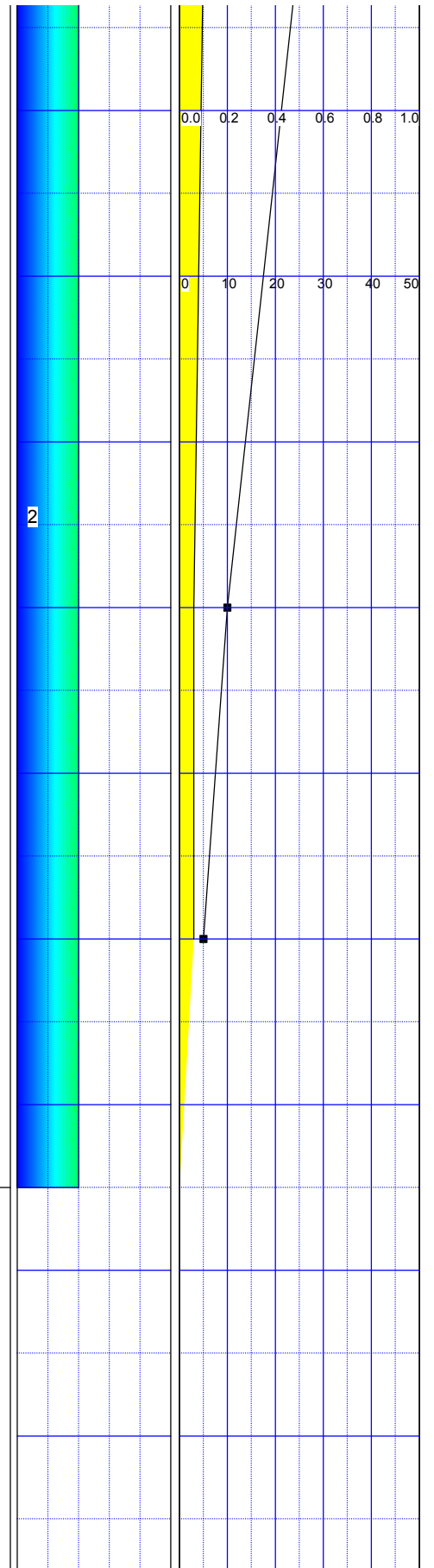
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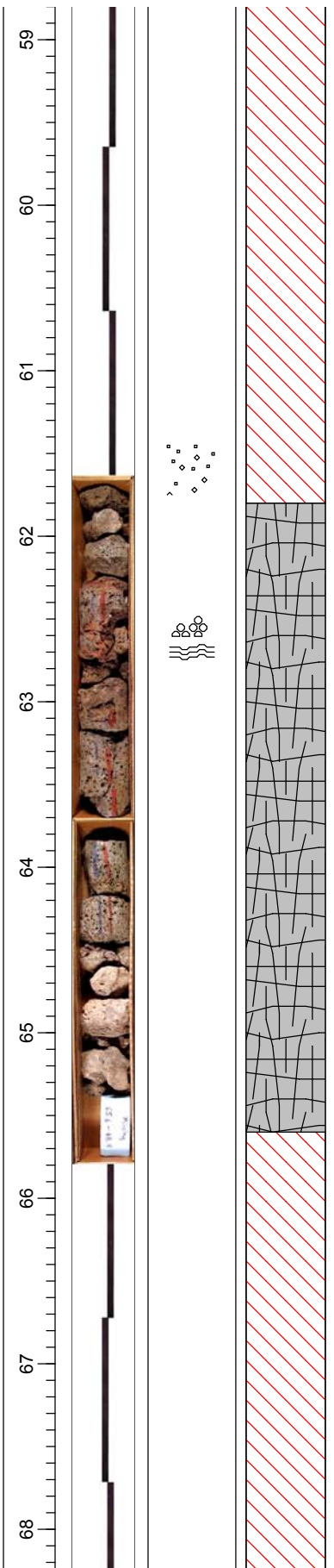
BASALT: COLOR: N4 Medium dark gray at top, grading into N6 medium light gray through center of interval, N3 dark gray at base.
 TEXTURE: Spatter features at top of interval. Aphanitic, porphyritic and very vesicular at top, diktytaxitic and vesicular through middle of interval. Vesicles increase in size and decrease in number to 49.3'. Vesicle sheet at 49.4', megavesicles every 8-10" from 46 to 48.7 ft. Diktytaxitic from 49.3 to 52.8 ft. Number of vesicles increases and size decreases from 53.8 ft to base. Flow features at 54 ft.
 COMPOSITION: 0.5% one mm euhedral olivine in felted plagioclase matrix at top. Olivine phenocrysts increase in size and abundance to a maximum of 5 mm and 3% at 55.8 ft.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Flow feature at base shows 5R 4/6 staining.





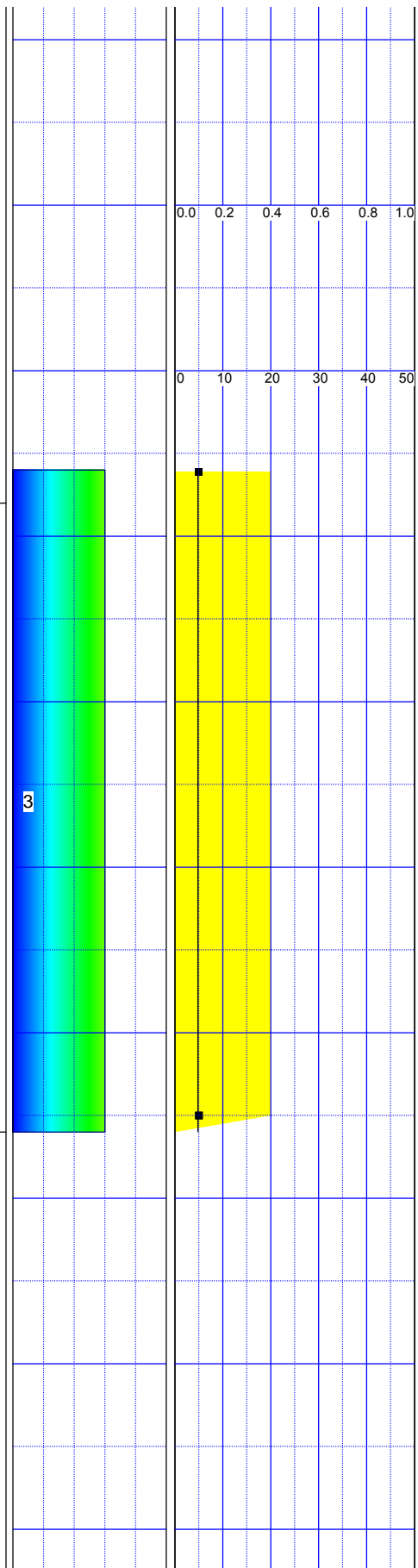
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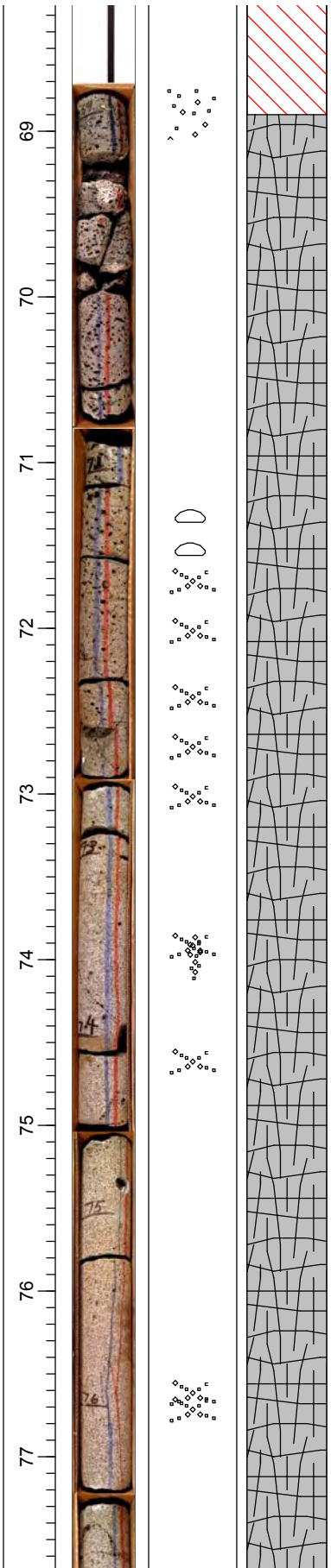




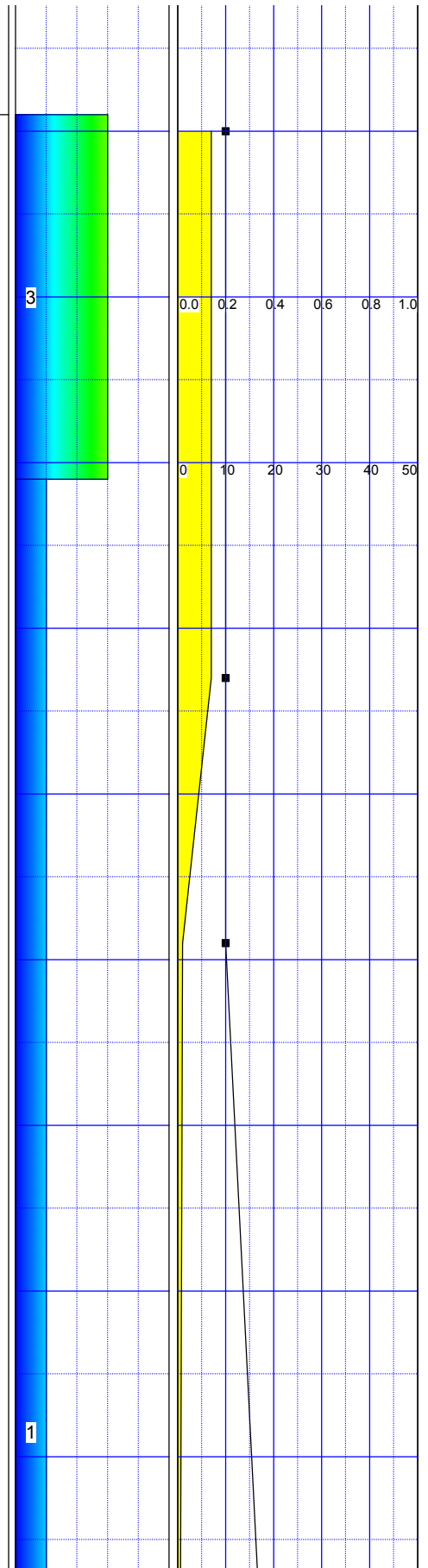
BASALT: COLOR: N4 medium dark gray at top, grading into N5 medium gray through center of interval, N3 dark gray at base. 5YR 7/2 Grayish orange pink sediment on surfaces at base of interval
 TEXTURE: Aphanitic, porphyritic, glomeroporphyritic, vesicular, diktytaxitic and vesicular through middle of interval, with 1-3% 1-3 mm euhedral to subhedral olivine phenocrysts in a diktytaxitic, felted plagioclase rich matrix,. Vesicles increase in size and decrease in number to base.
 COMPOSITION: 1.0 to 3% 3-mm euhedral to subhedral olivine glomerocrysts in felted plagioclase matrix
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Flow feature at base shows 10R 4/6 moderate reddish brown staining.

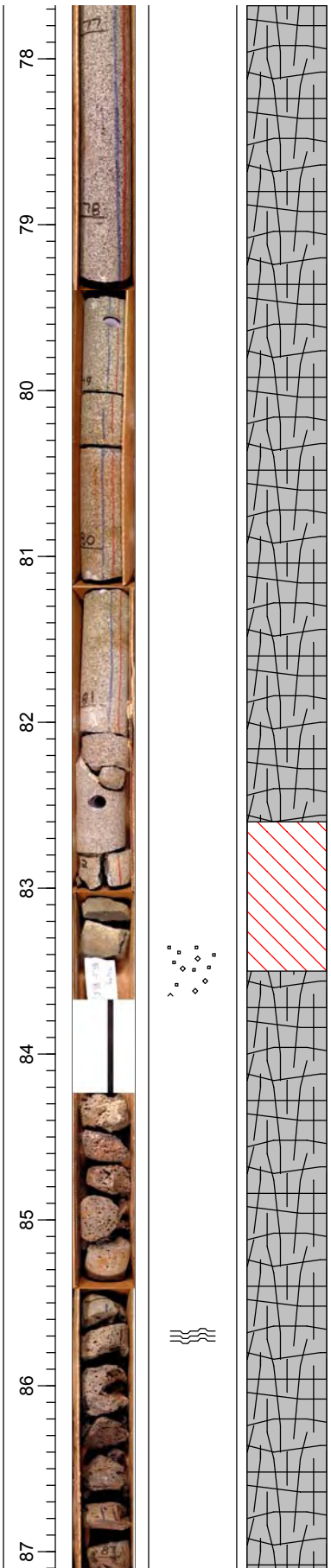
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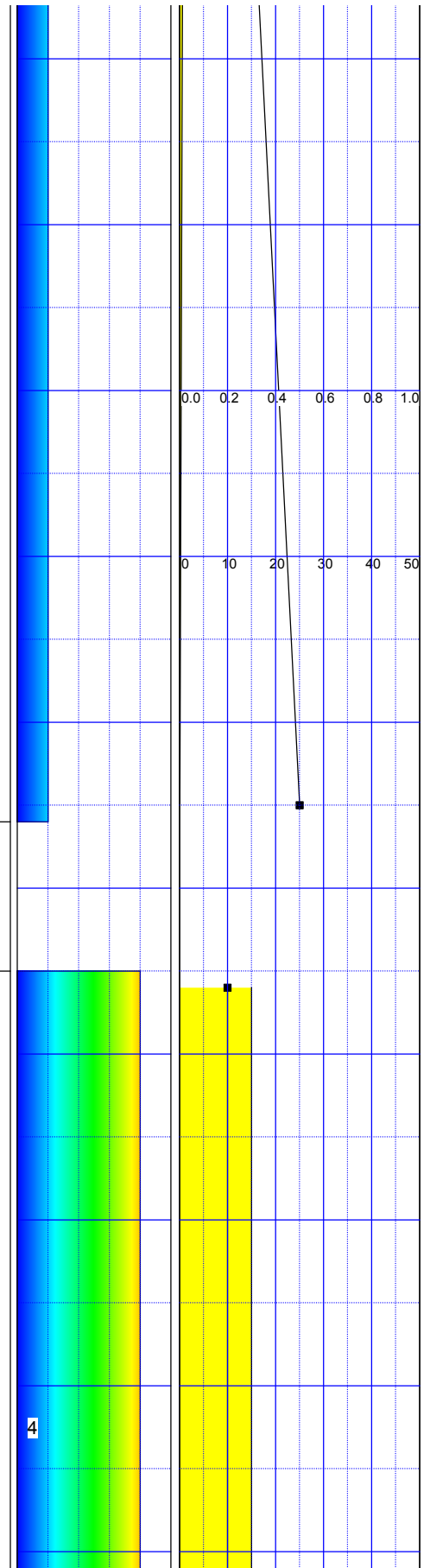
BASALT: COLOR: N4 medium dark gray at top, grading into N5 medium gray through center of interval, N5 medium gray at base. 10 YR 8/2 very pale orange sediment on surfaces at base of interval
 TEXTURE: Phaneritic, porphyritic, vesicular, diktytaxitic and vesicular through middle of interval, Vesicles increase in size and decrease in number from top of interval to 73', diktytaxitic from 72 ft to base of interval. 1-3% 3-5 mm olivine glomerocrysts in addition to interstitial olivine in diktytaxitic interval. Vesical planes at 72.3, 72.9, 73.7, 74.4, 76.6 ft.
 COMPOSITION: 30-35% 0.5-1 mm olivine phenocrysts in a diktytaxitic, plagioclase rich matrix. 60-65% plagioclase phenocrysts up to 1 mm in size, approximately 5% black aphanitic matrix.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: N9 white non-calcite cryptocrystalline mineral on some fracture surfaces and in some vesicles, N9 white calcite encrustation on fracture at 81.4 ft, reddish alteration on some olivine phenocrysts, more noticeable near base



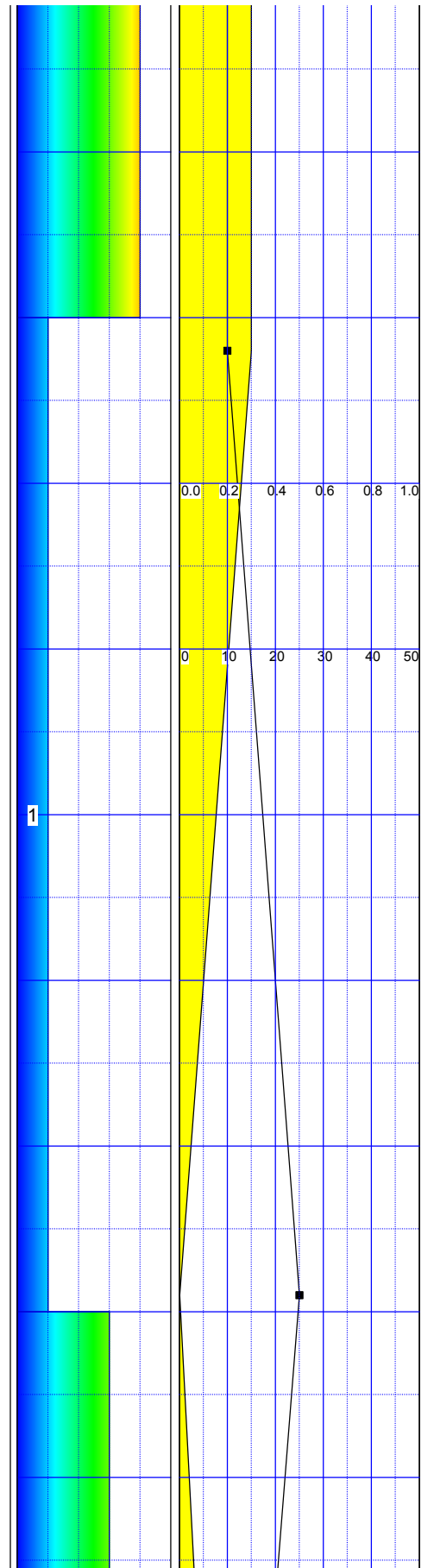
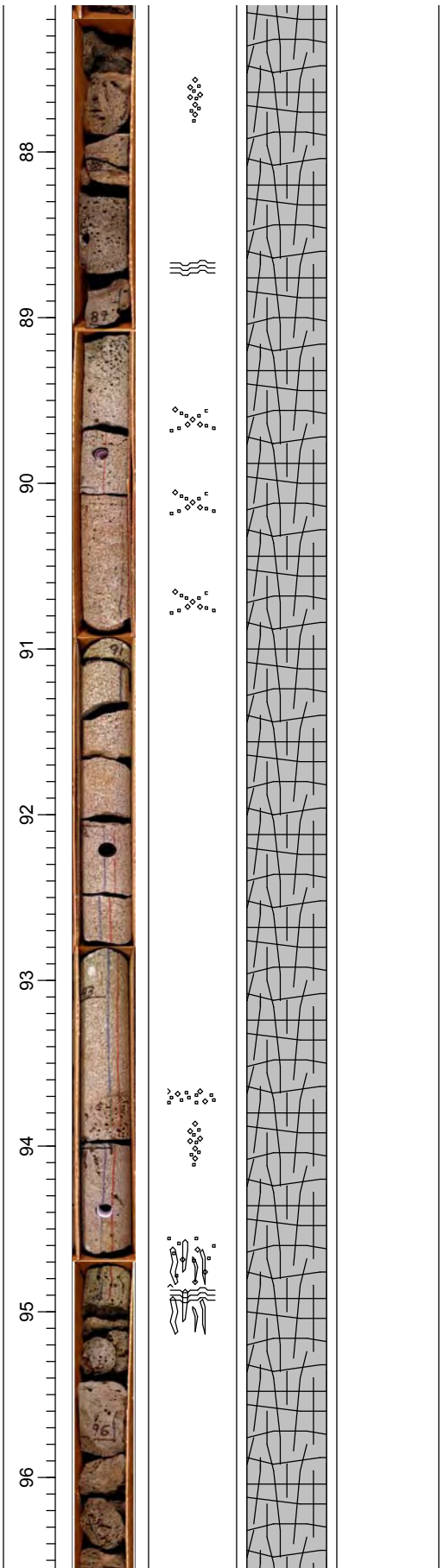


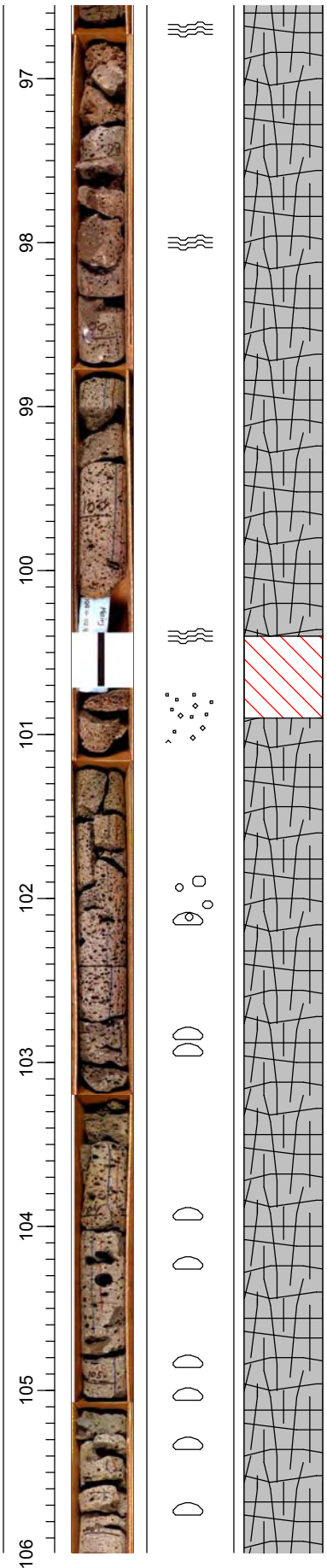
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BASALT: COLOR: 5R 4/2 grayish red at top, grading to 10R 4/2 grayish red at 88 ft, then N4 medium dark gray with reddish staining to base. 10 YR 5/4 moderate yellowish brown sediment on surfaces at base of interval
 TEXTURE: Rubby, aphanitic and vesicular from top of interval to 88.8 ft, flow features at 87.8 and 88.9 ft, plagioclase phenocrysts are apparent at 87 ft
 Phaneritic, porphyritic, diktytaxitic from 88.8 ft to 95 ft. Vesicle planes at 89.7, 90.1, 94 ft. Nearly aphanitic from 95 ft to 98.5 ft. Flow feature at 95 ft, pipe vesicles at 95.9 ft. Diktytaxitic and vesicular from 98.5 ft to base of interval, with flow feature at base of interval.
 COMPOSITION: 30-35% 0.5-1 mm olivine phenocrysts in a diktytaxitic, plagioclase rich matrix. 60-65% plagioclase phenocrysts up to 1mm in size, approximately 3% black aphanitic matrix. 0.5 to 1% black subhedral pyroxene phenocrysts.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Black or red alteration surfaces inside vesicles, and on flow feature surfaces.



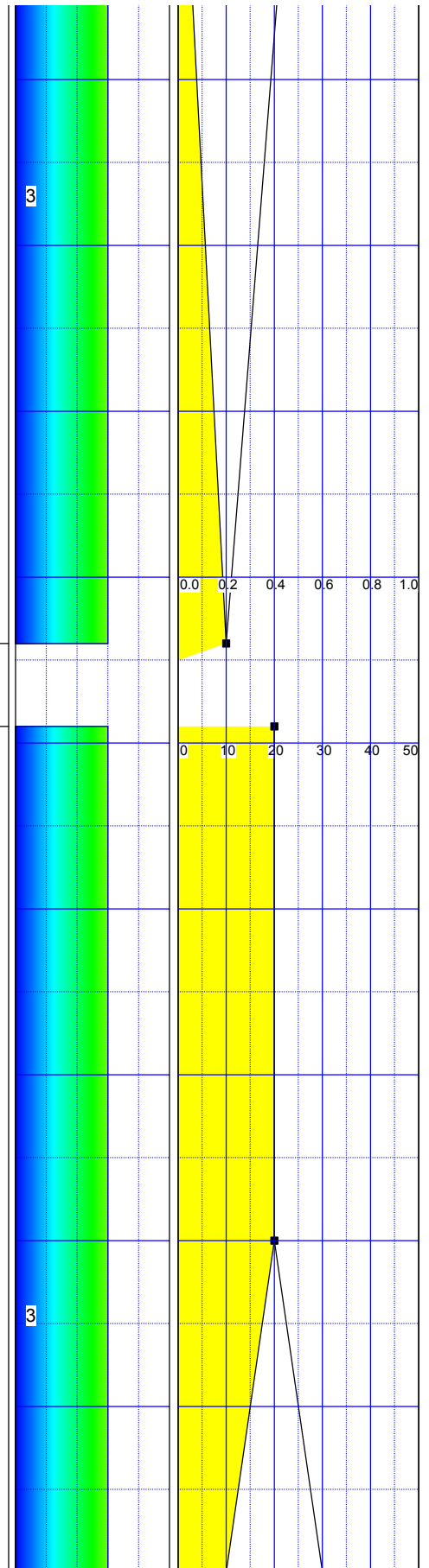
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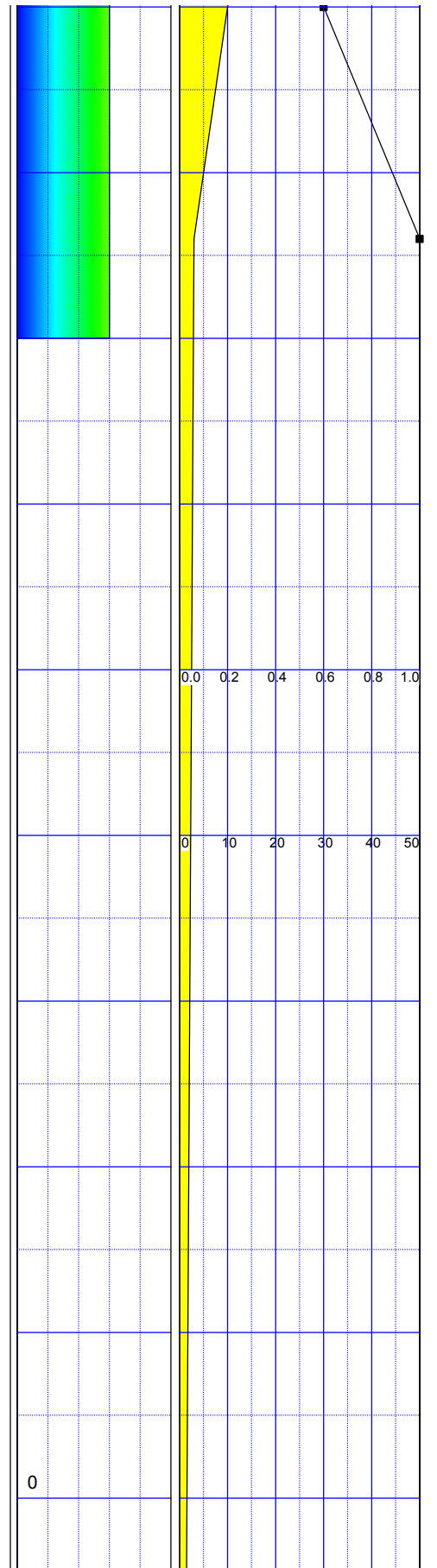
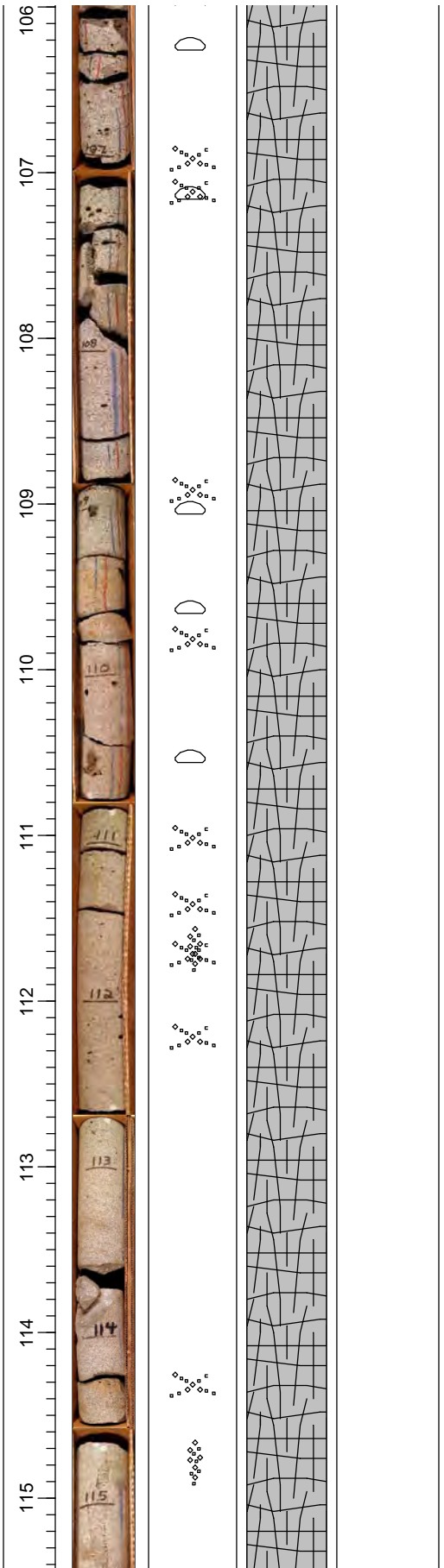


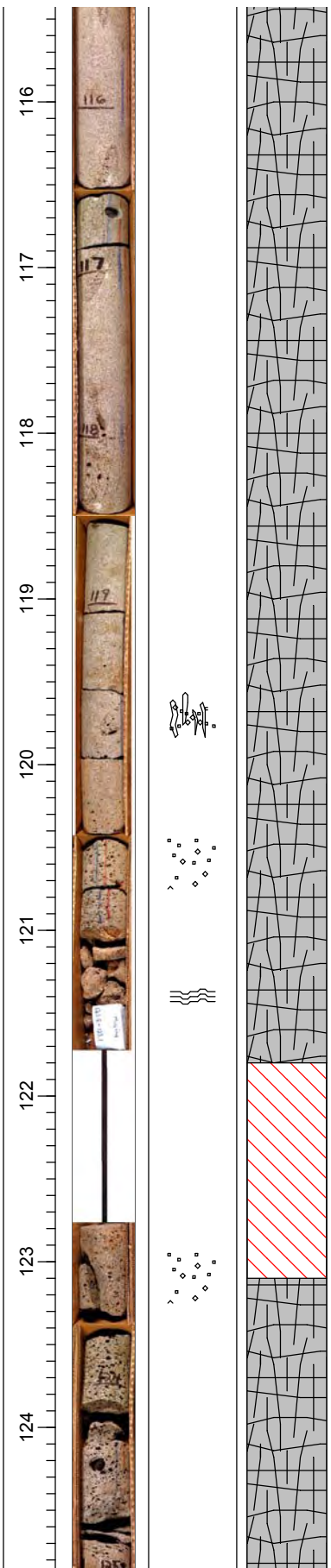


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BASALT: COLOR: N4 medium dark gray at top, grades to N5 medium gray in middle of interval, then at about 120 ft, N3 dark gray with reddish staining to base.
 TEXTURE: Aphanitic, vesicular from top of interval to 103.8 ft, then sparsely vesicular, fine-grained, and porphyritic to 108.7 ft, fine-grained, porphyritic and diktytaxitic to 120.4 ft, then fine-grained, diktytaxitic, vesicular, and porphyritic to base of interval. Megavesicles from 103.8 to 111 ft; vesicle plane at 116-117 ft. vesicle cylinder at 118 ft, increasingly vesicular from 120.6 ft to base.
 COMPOSITION: 30-35% 0.5-1 mm olivine phenocrysts in a diktytaxitic, plagioclase rich matrix, . 60-65% plagioclase phenocrysts up to 1mm in size, approximately 1% olivine glomerocrysts 2-4 mm in size, approximately 1% black aphanitic matrix, 0.5 to 1% black subhedral pyroxene phenocrysts.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Black or red alteration inside vesicles, and on flow feature surfaces.

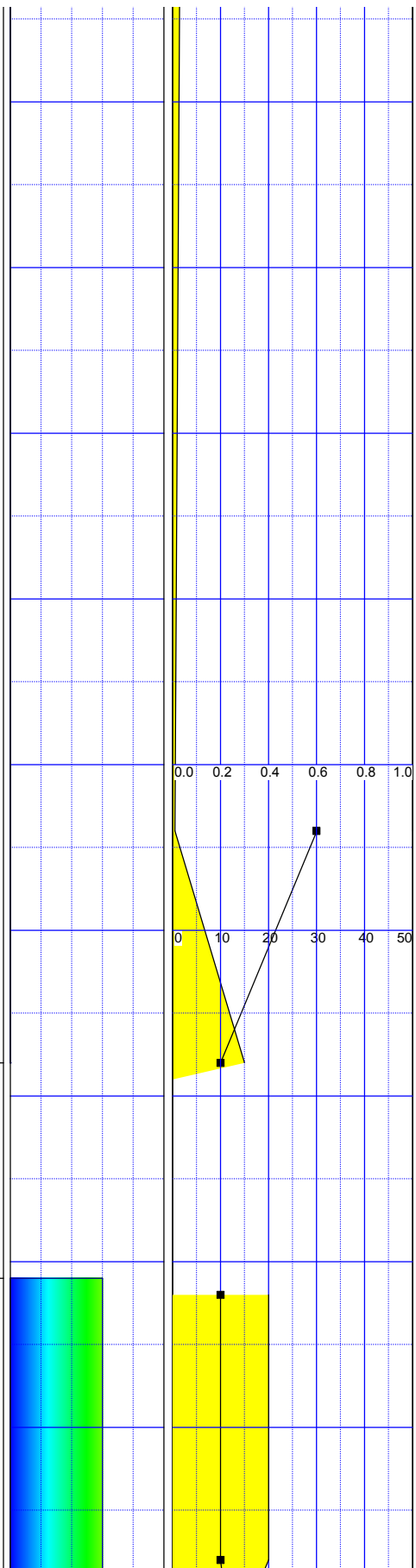


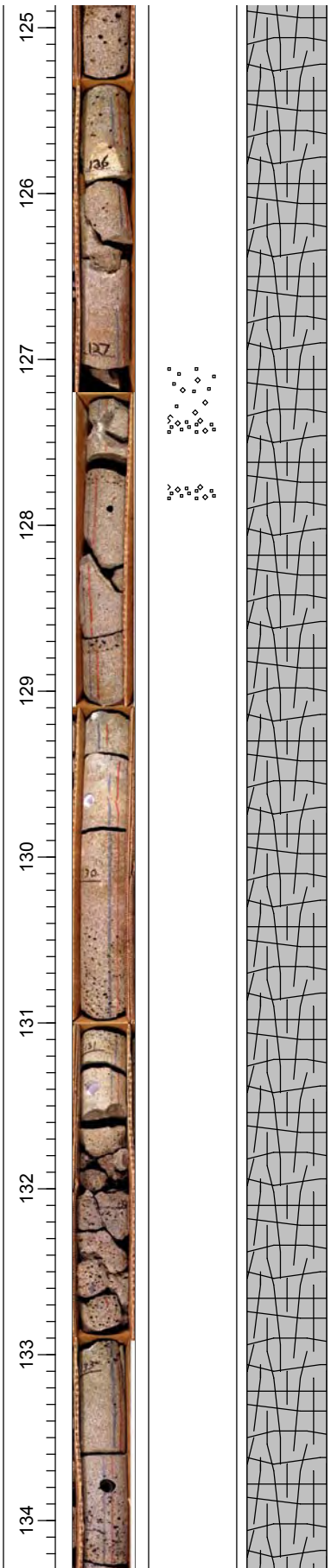




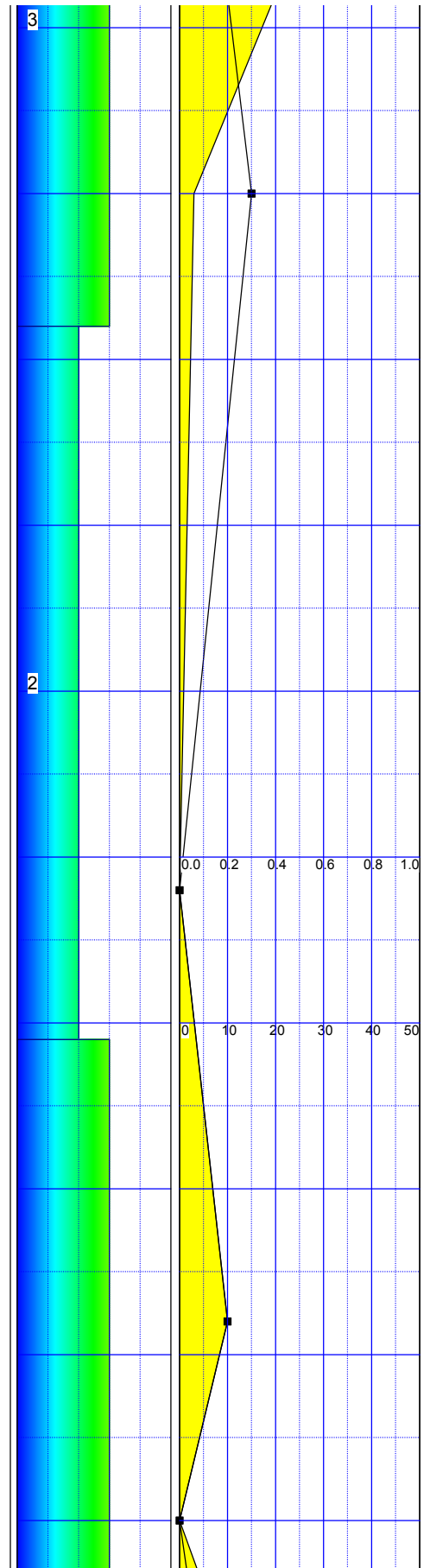
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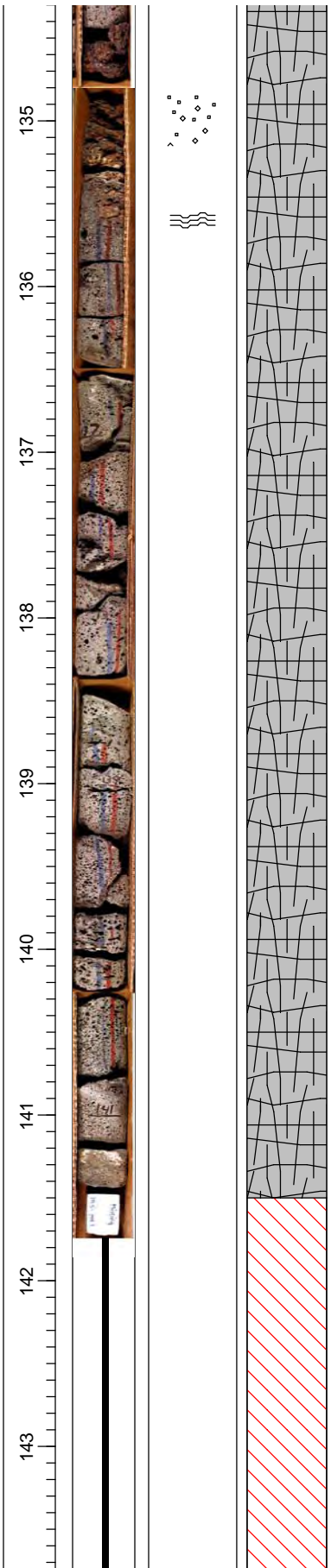
BASALT: COLOR: N4 medium dark gray at top
 TEXTURE: Aphanitic, porphyritic, vesicular from top of interval to 123.7 ft, then vesicular, diktytaxitic, porphyritic, glomeroporphyritic, fine-grained matrix, plagioclase phenocrysts up to 5 mm long, 1-2 mm olivine phenocrysts in matrix, 1-2 cm plagioclase crystals with 2 mm euhedral olivine phenocrysts in glomerocrysts throughout rest of interval, glomerocrysts decrease in number and size with increasing depth. Vesicle planes, sheets in interval from, porphyritic and diktytaxitic to 120.4 ft, then fine-grained, diktytaxitic, vesicular, and porphyritic to base of interval. Megavesicles from 103.8 to 111



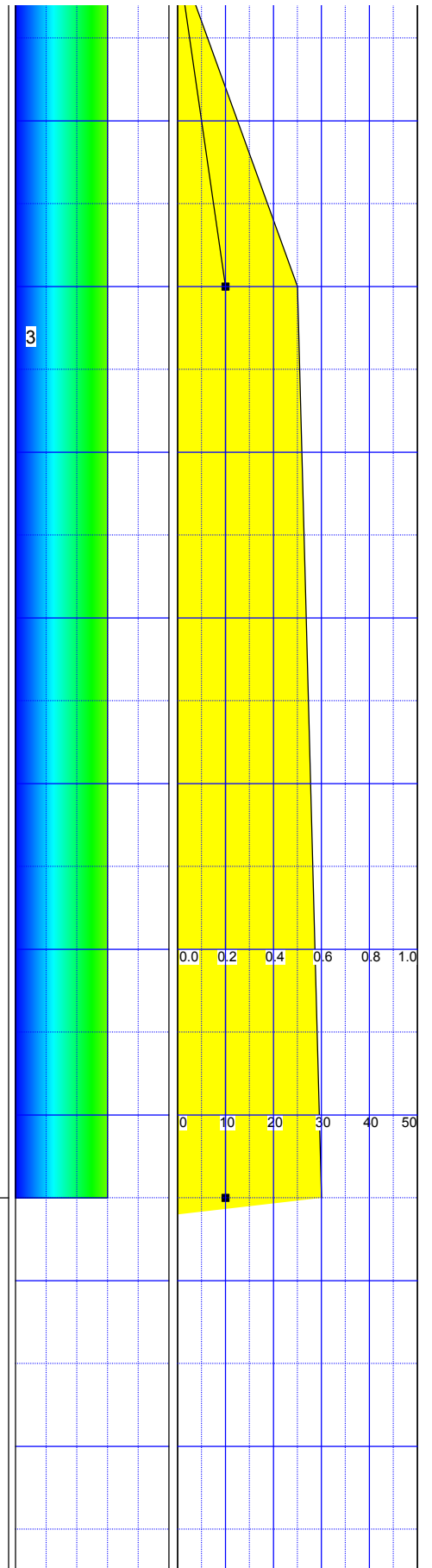


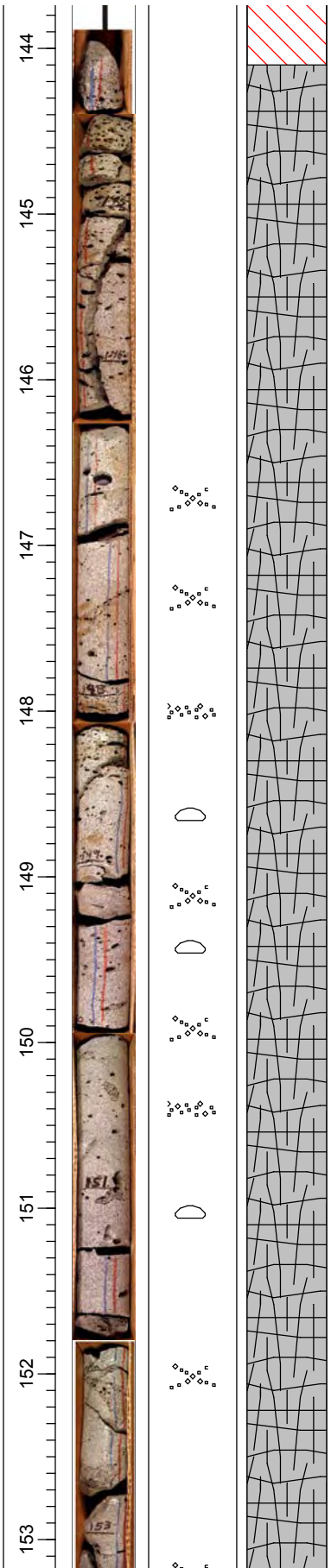
ft; vesicle plane at 116-117 ft. vesicle cylinder at 118 ft, increasingly vesicular from 120.6 ft to base.
 COMPOSITION: 30-35% 0.5-1 mm olivine phenocrysts in a diktytaxitic, plagioclase-rich matrix, 60-65% plagioclase phenocrysts up to 1 mm in size, approximately 1% olivine glomerocrysts 2-4 mm in size, approximately 1% black aphanitic matrix, 0.5 to 1% black subhedral pyroxene phenocrysts.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: Black or red alteration inside vesicles, and on flow feature surfaces.



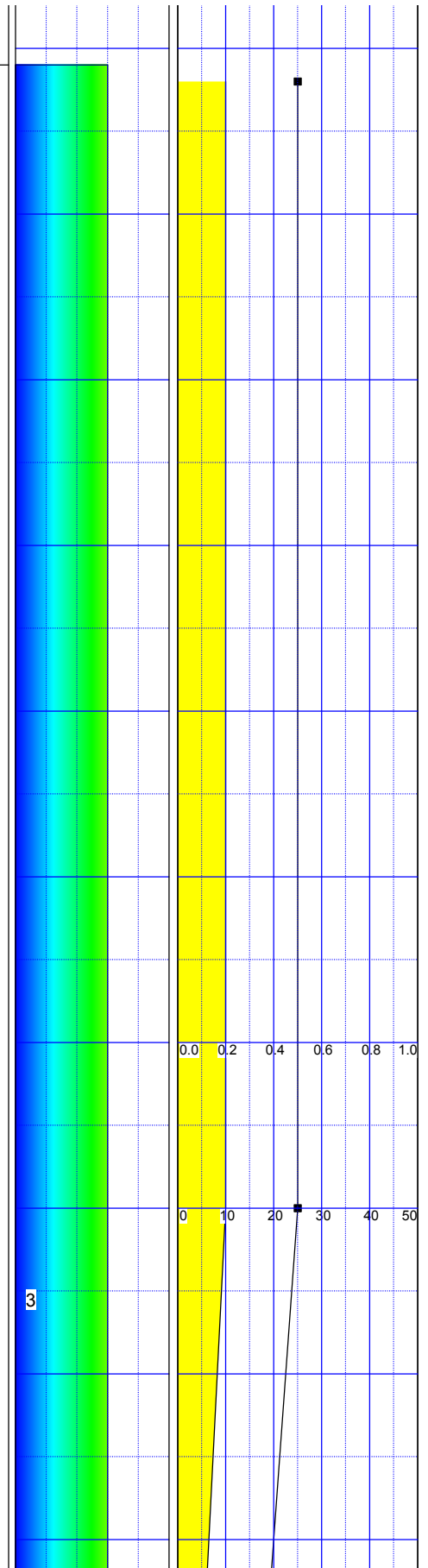


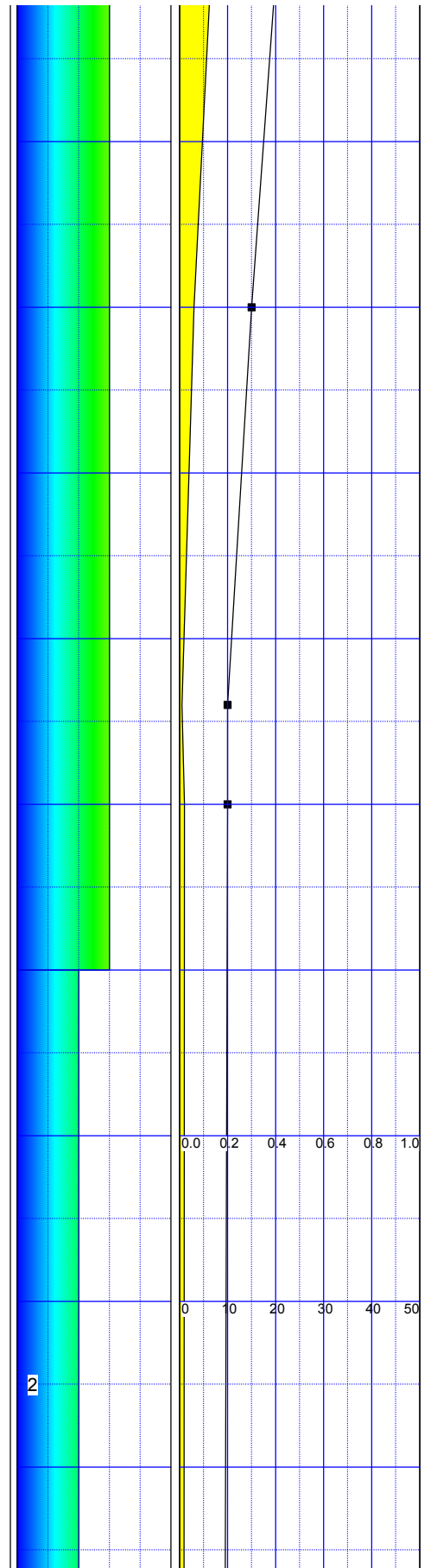
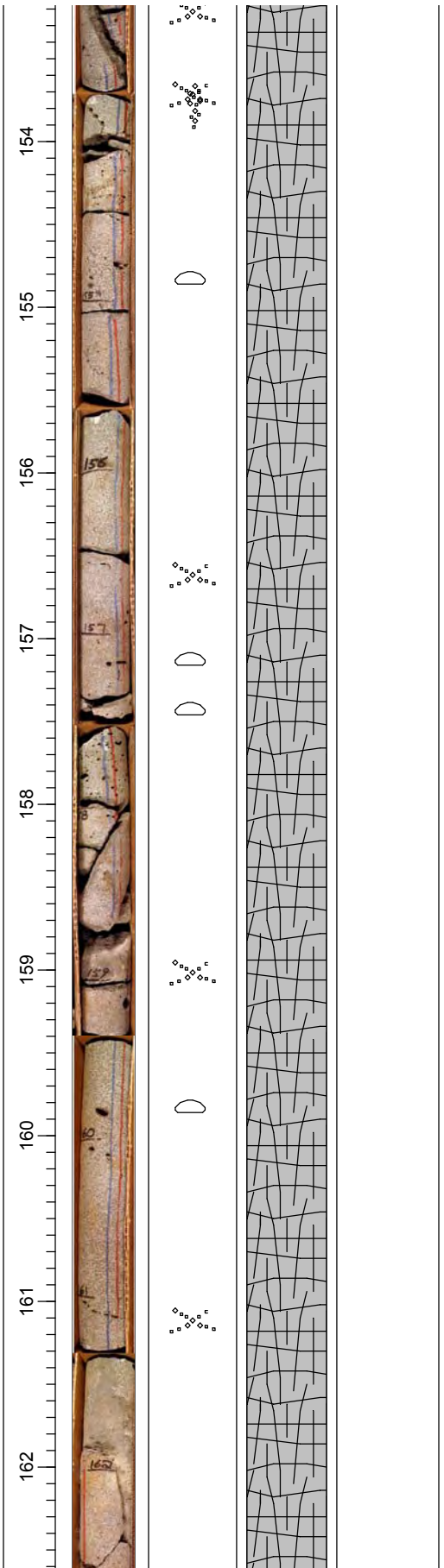
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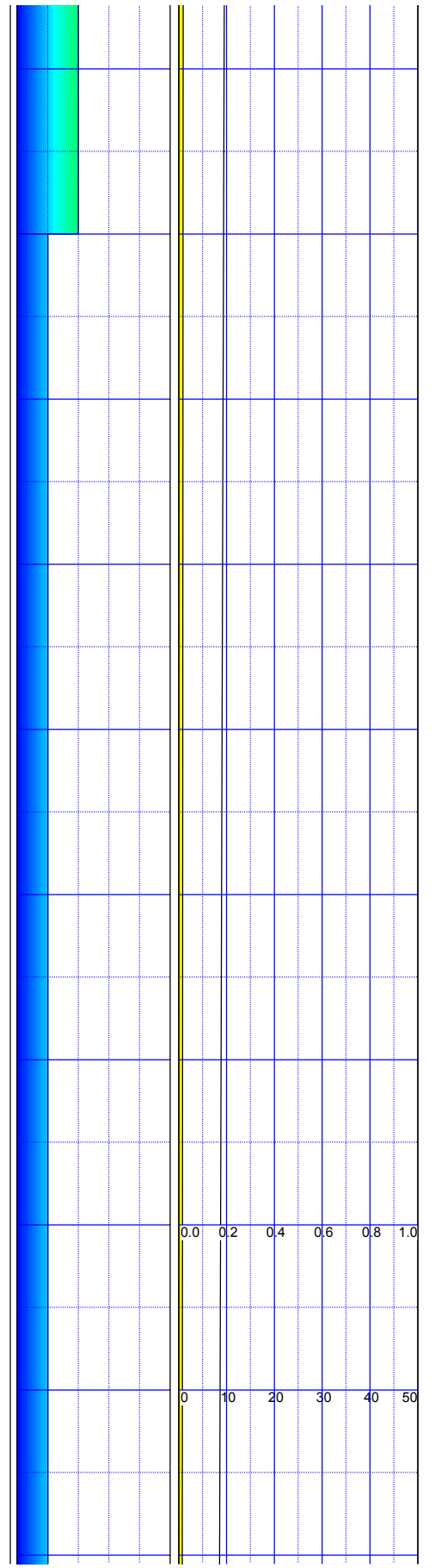
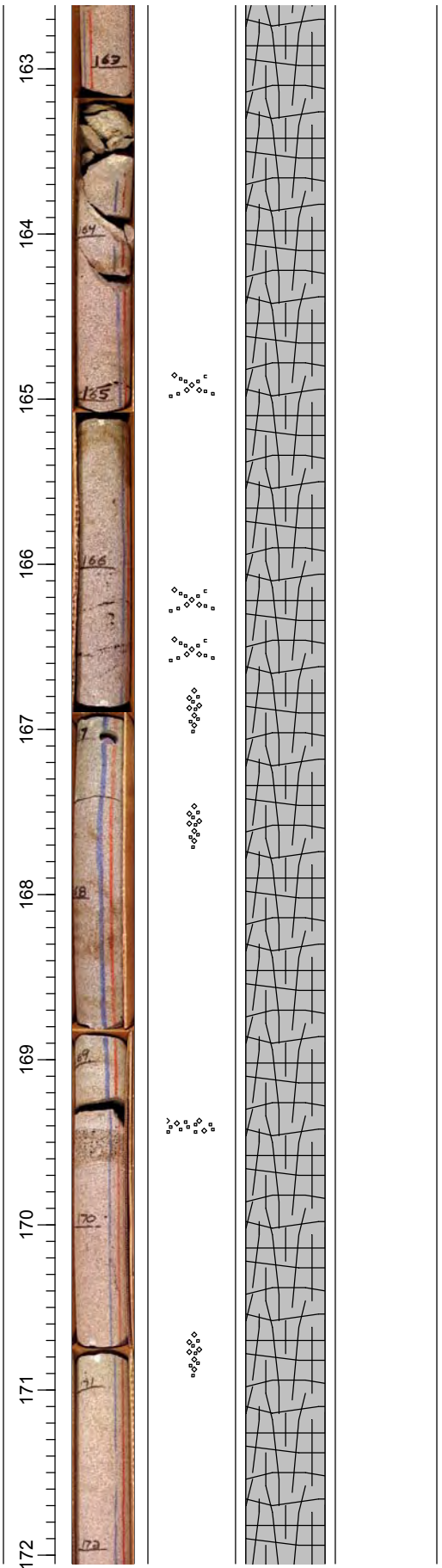


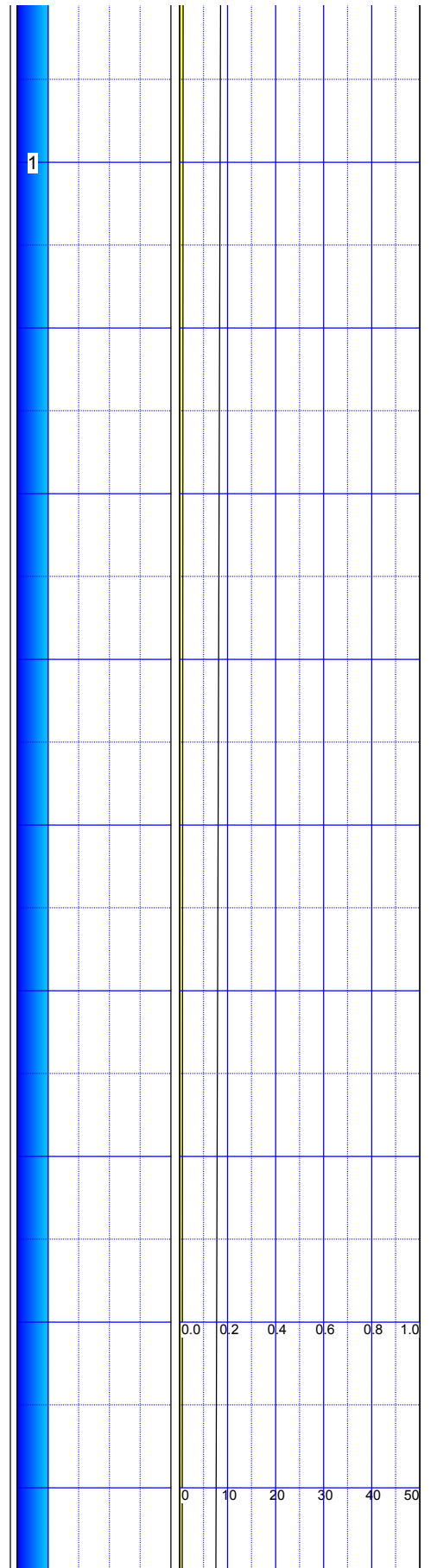
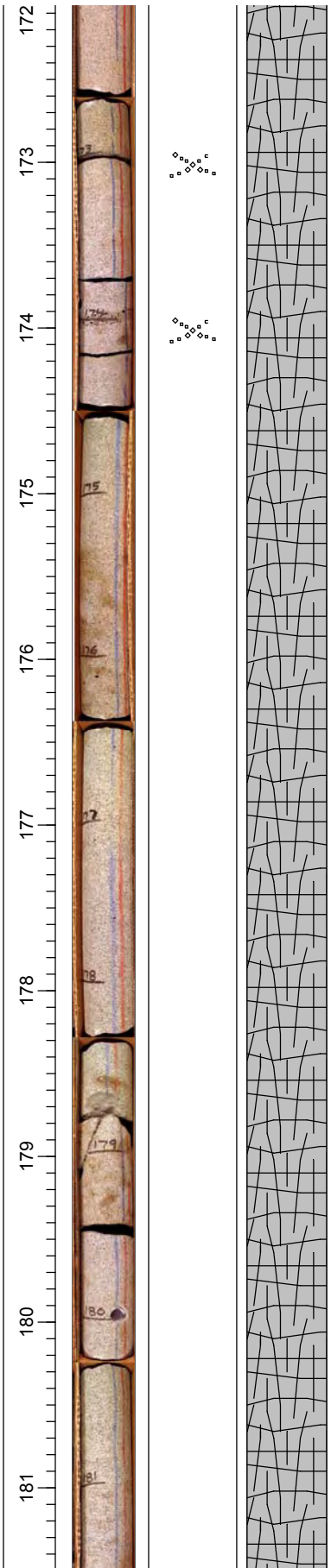


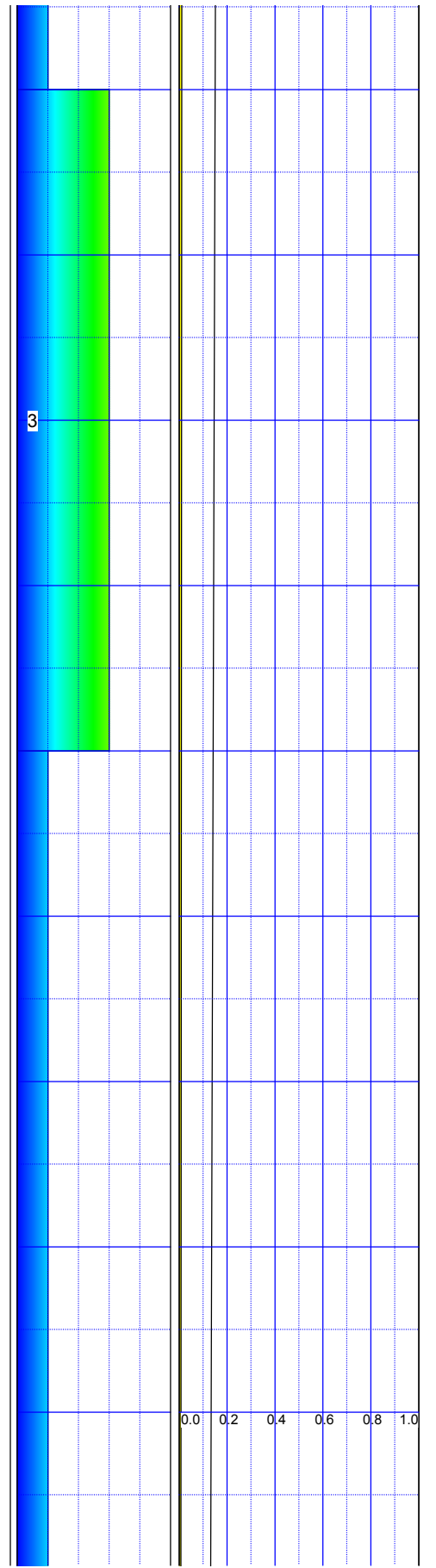
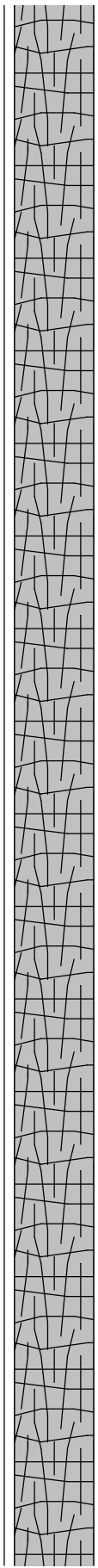
BASALT: COLOR: N5 medium light gray to 207 ft, then N4 medium dark gray to base
 TEXTURE: Fine-grained, porphyritic, diktytaxitic, vesicular from top of interval to 151.3 ft, number of vesicles decreases and size increases with depth, 0.5-2 mm olivine phenocrysts in matrix of plagioclase crystals. Vesicle planes, sheets in interval from 151 ft to 174 ft, microporphyritic and diktytaxitic to 205.8 ft, then fine-grained, diktytaxitic, vesicular, and porphyritic to base of interval.
 COMPOSITION: 30-35% 0.5-2 mm olivine phenocrysts in a diktytaxitic, plagioclase rich matrix.
 XENOLITHS / AUTOLITHS: Autoliths at 150 ft-151 ft
 ALTERATION: 10YR 6/6 dark yellowish-orange alteration inside vesicles, and on flow feature surfaces at base of interval

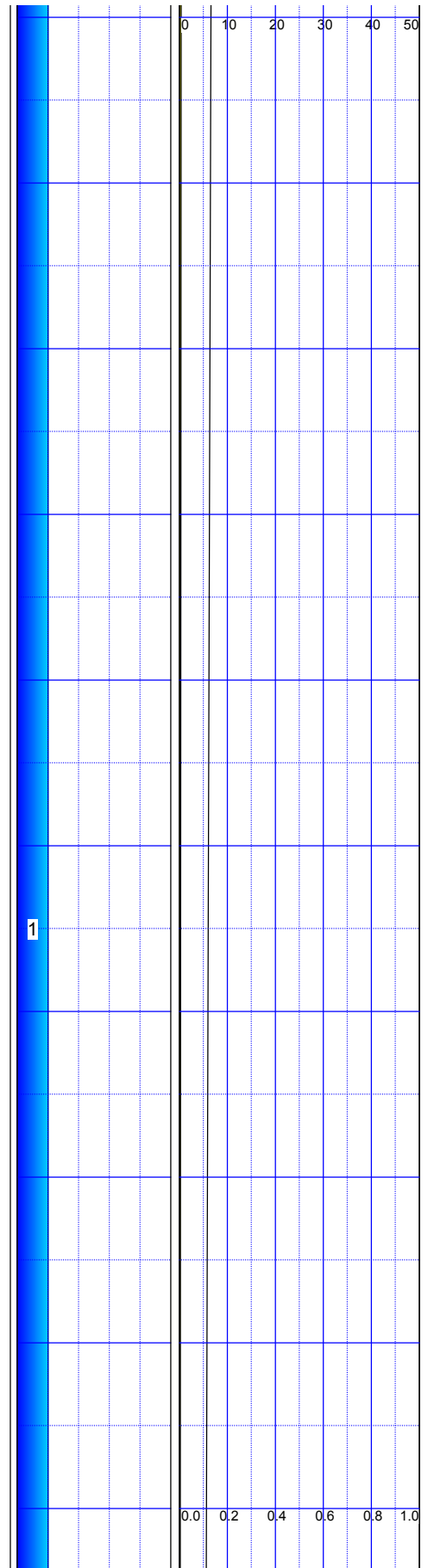
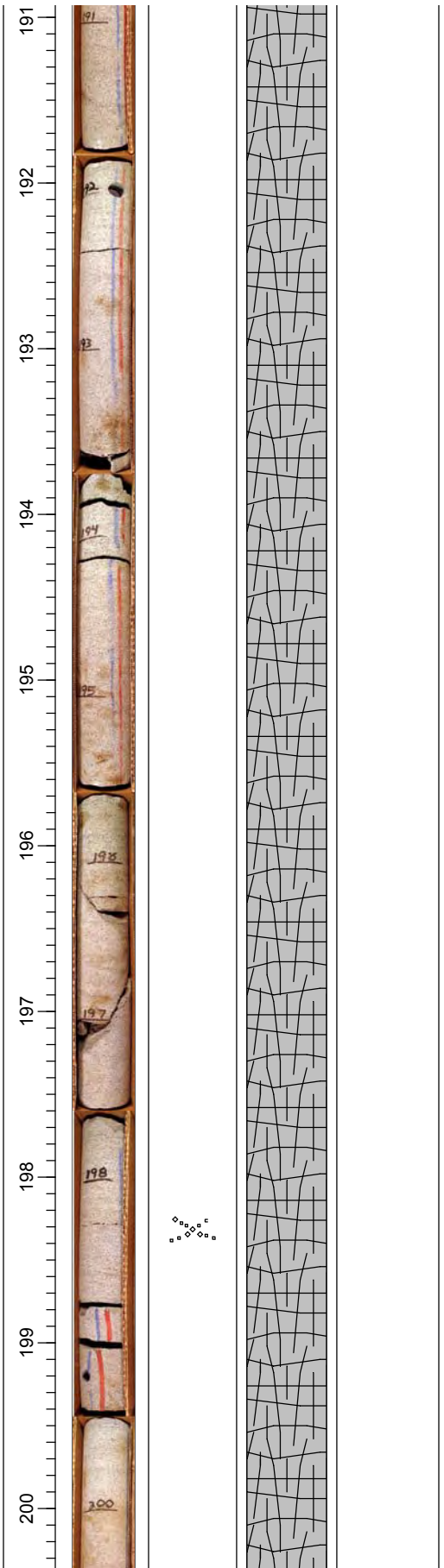


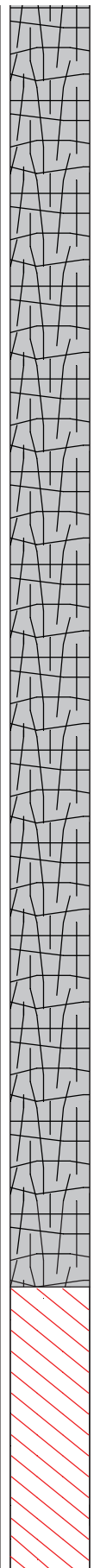




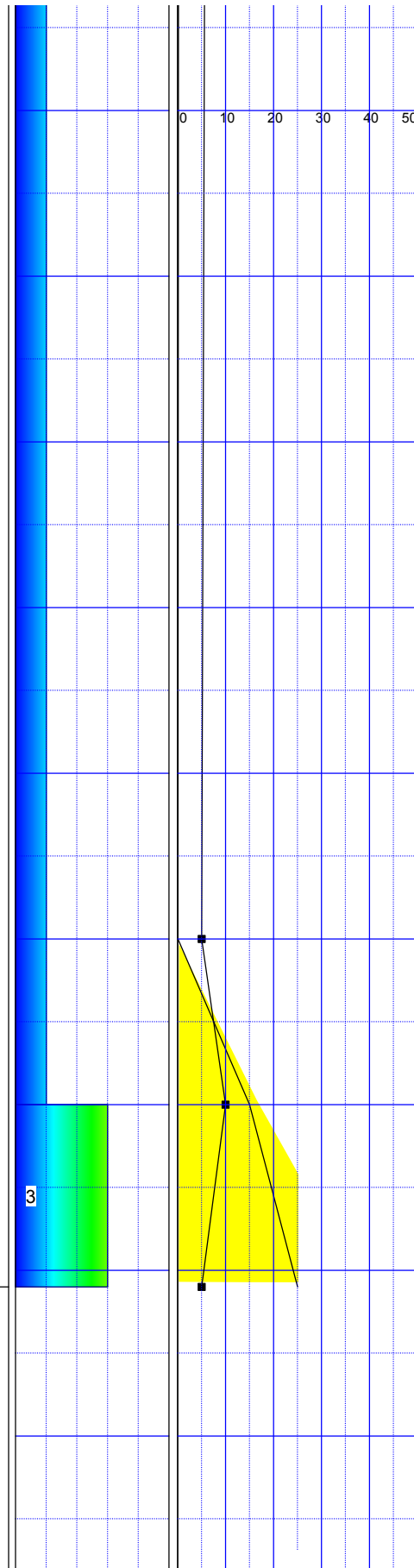


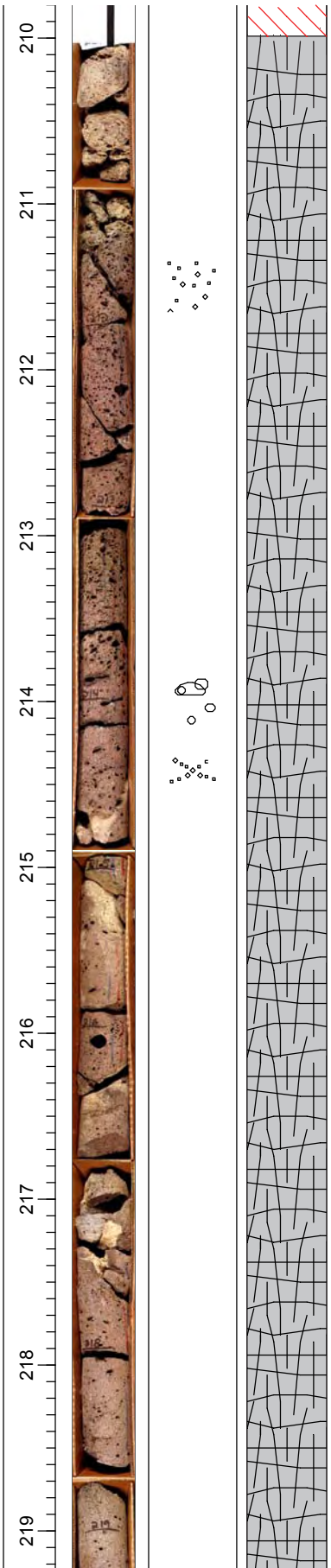




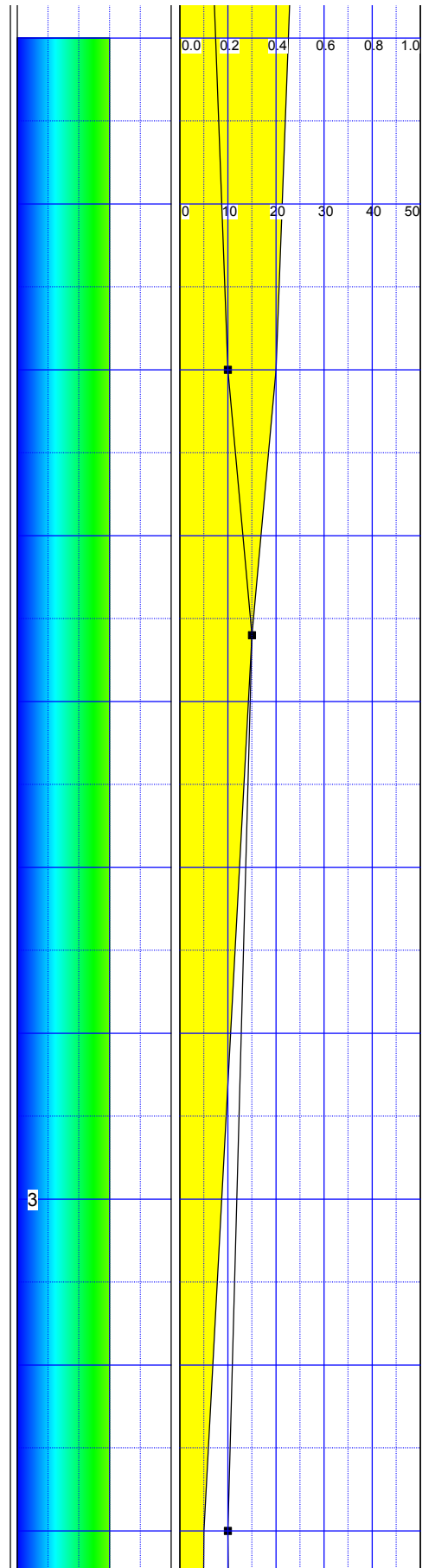


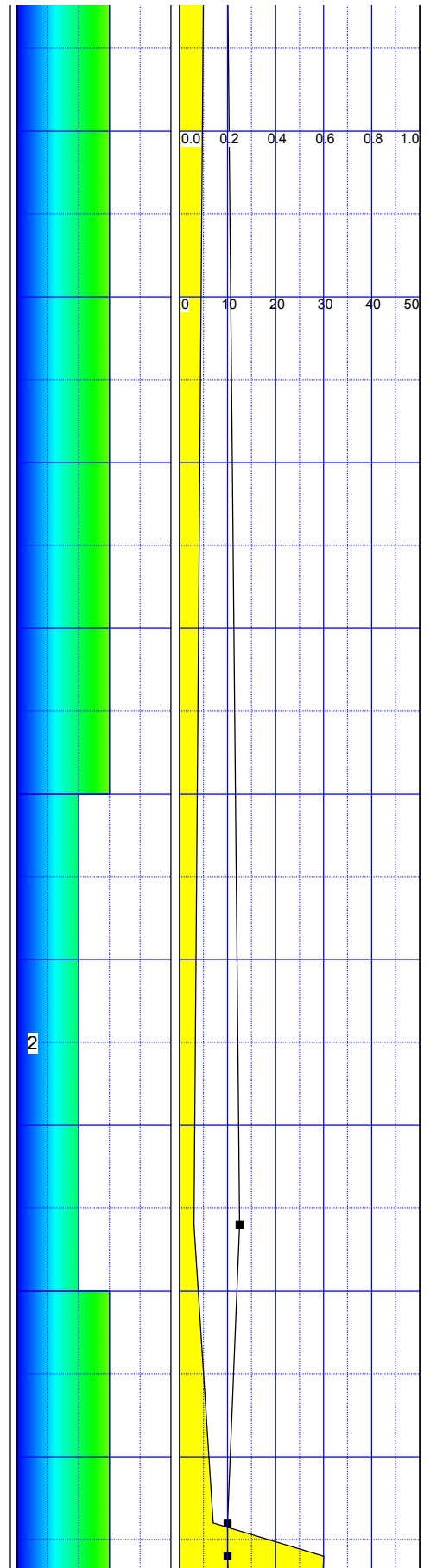
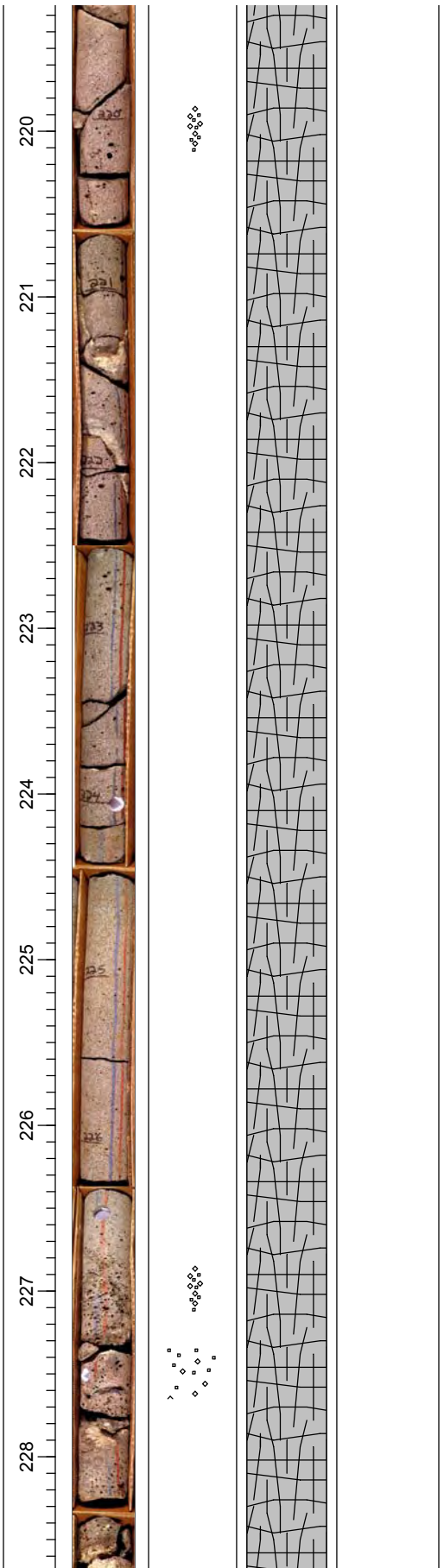
BASALT: COLOR: 5YR 6/1 Light brownish gray from 208.1 ft, then N4 medium dark gray to base at 233.9 ft
 TEXTURE: Fine-grained, porphyritic, diktytaxitic, slightly vesicular from top of interval to 223 ft, then number of vesicles decreases and size increases with depth to 223.8 ft, diktytaxitic from 220 ft to 226.7 ft then vesicular to base.
 COMPOSITION: 10% 1-2 mm subhedral to euhedral olivine phenocrysts in felty matrix of plagioclase crystals.
 XENOLITHS / AUTOLITHS: Autoliths at 150-151 ft
 ALTERATION: 10YR 2/2 dusky yellowish brown

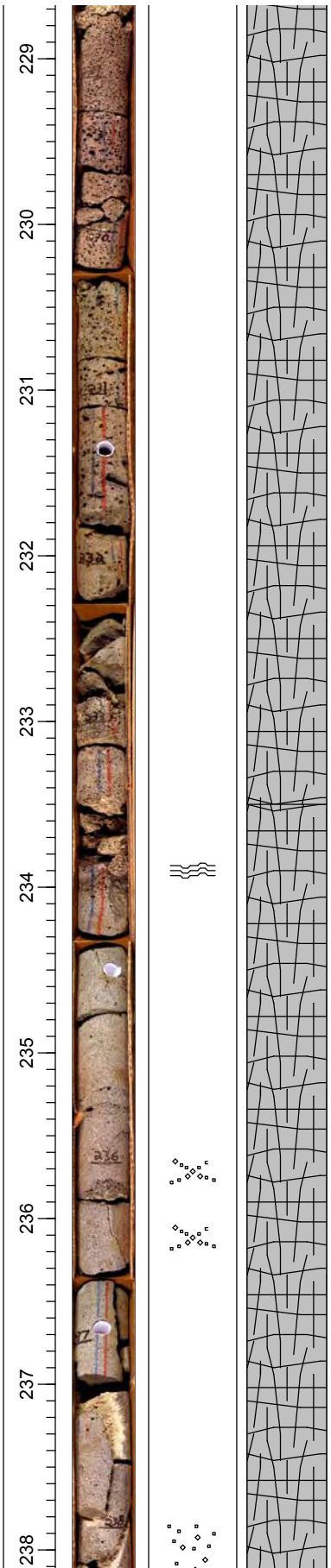




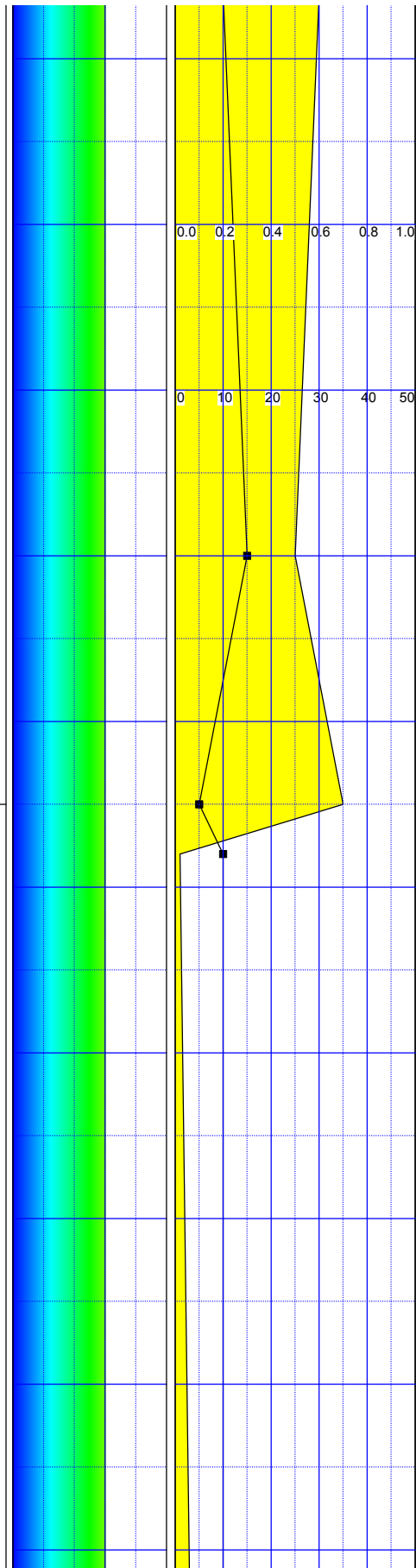
sediment inside vesicles and on fracture surfaces. White film inside some vesicles
FREE CARBONATES: in sediment on fractures at: 215, 216.8-217.6, 221, 227.3, 218.6, 229.8 ft, and at flow/mold structures from 233.5-233.8 ft

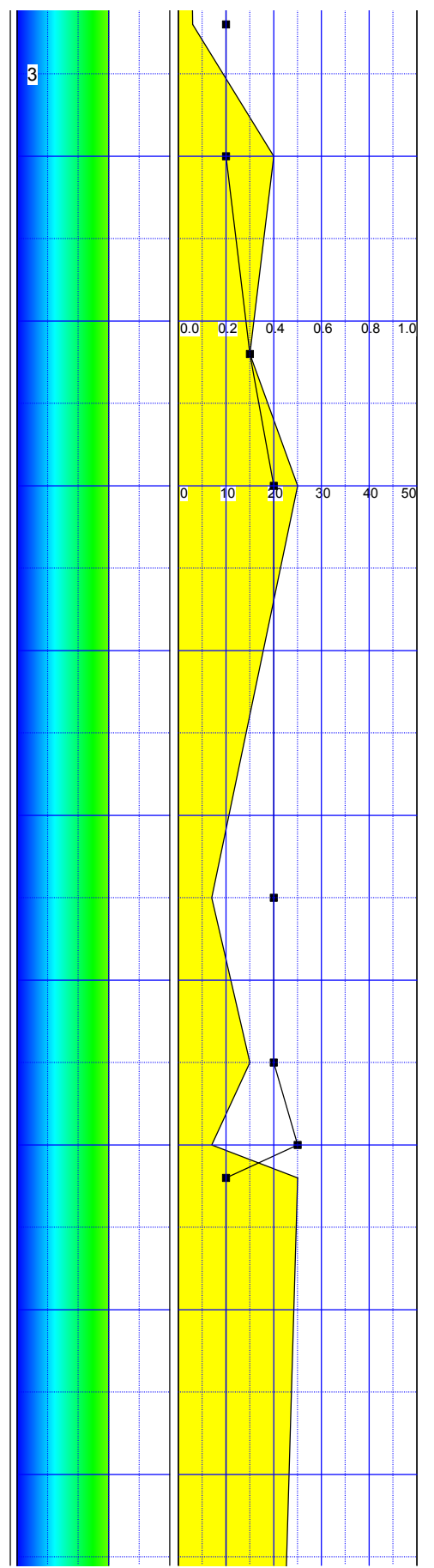
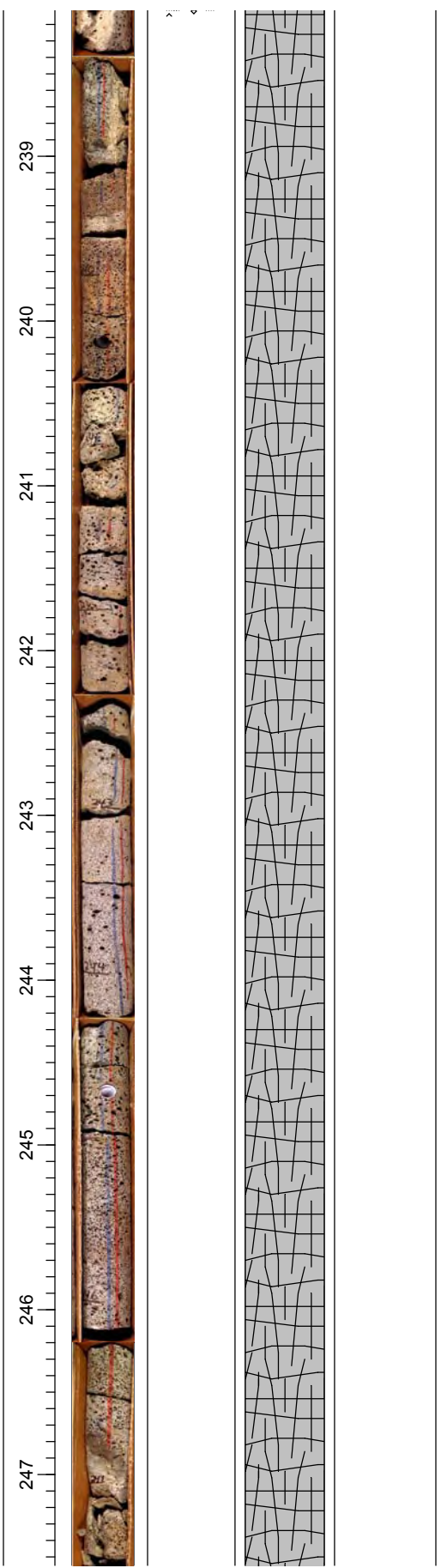


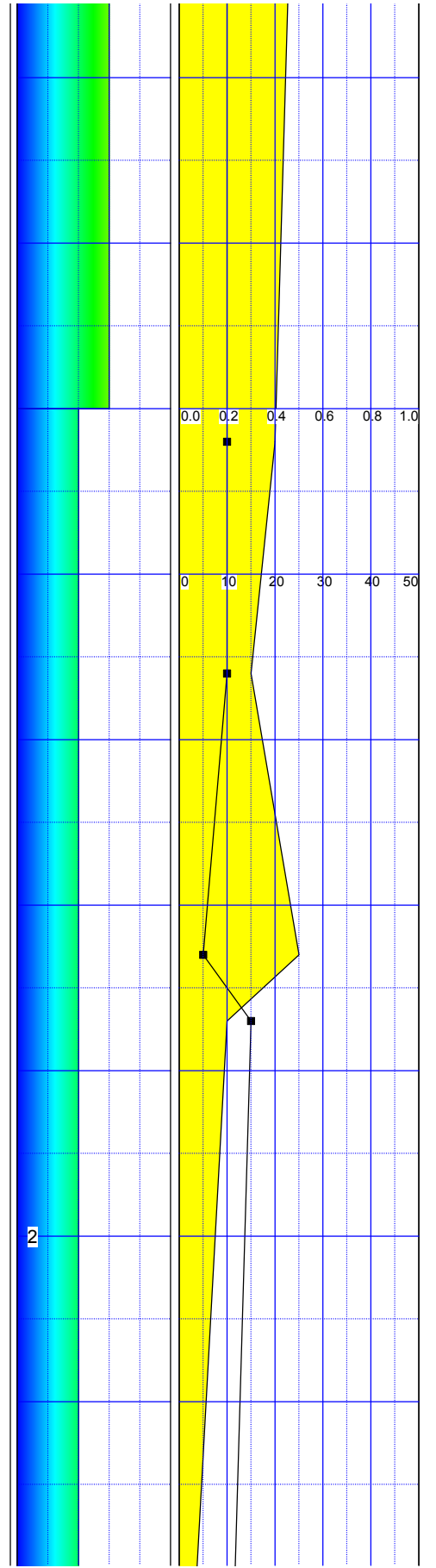
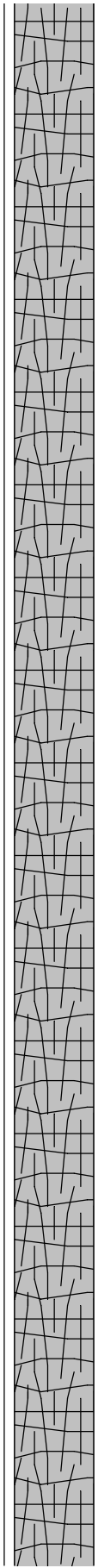


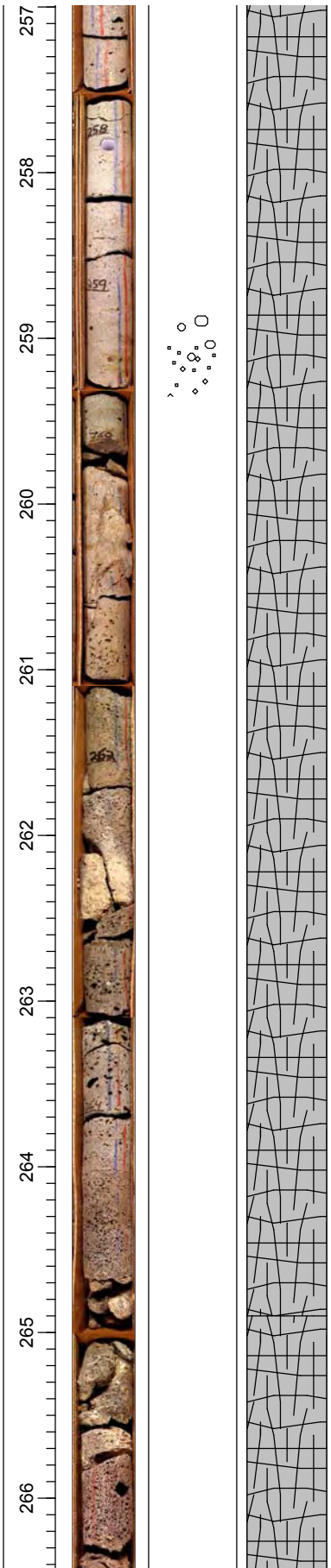


BASALT: COLOR: N3 dark gray basalt from top, grading to N5 medium gray by 243 ft, then darker to N4 medium dark gray to base
 TEXTURE: Porphyritic-aphanitic, glomeroporphyritic, and granular
 COMPOSITION: 10-15% 0.5-1 mm subhedral olivine phenocrysts a felted plagioclase and groundmass matrix. Olivine phenocrysts form agglomerations up to 2 mm in vesicular zones.
 XENOLITHS / AUTOLITHS: Autolith at 256.6 ft
 ALTERATION: N3 dark gray to N2 grayish black oxidation on flow surface at top of interval
 FREE CARBONATES: Yes, in 10YR 8/2 very pale orange very fine-grained sediment found in fractures

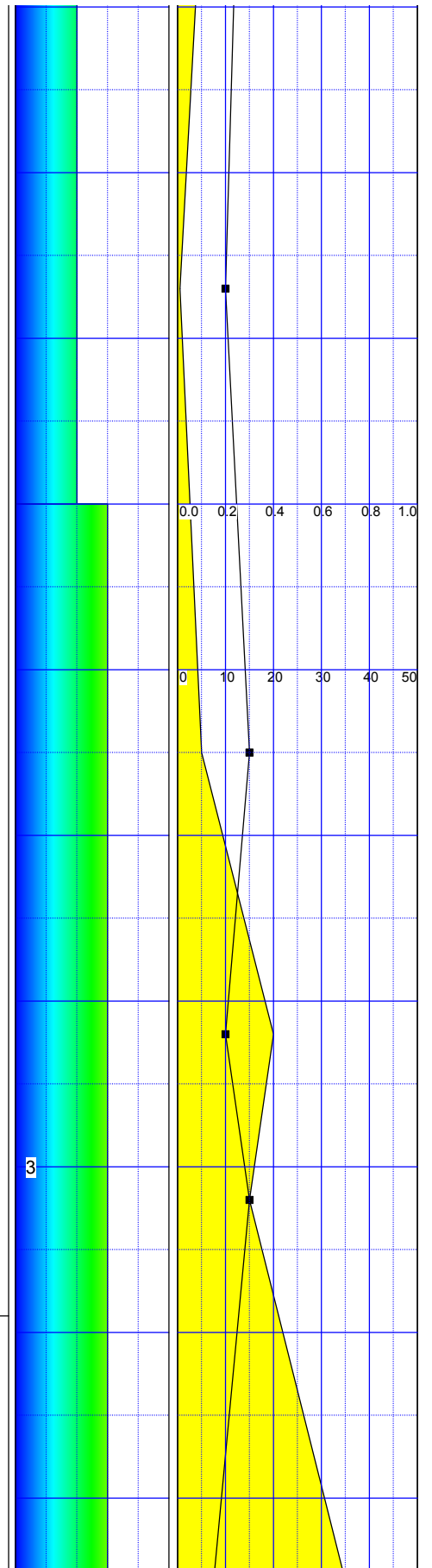


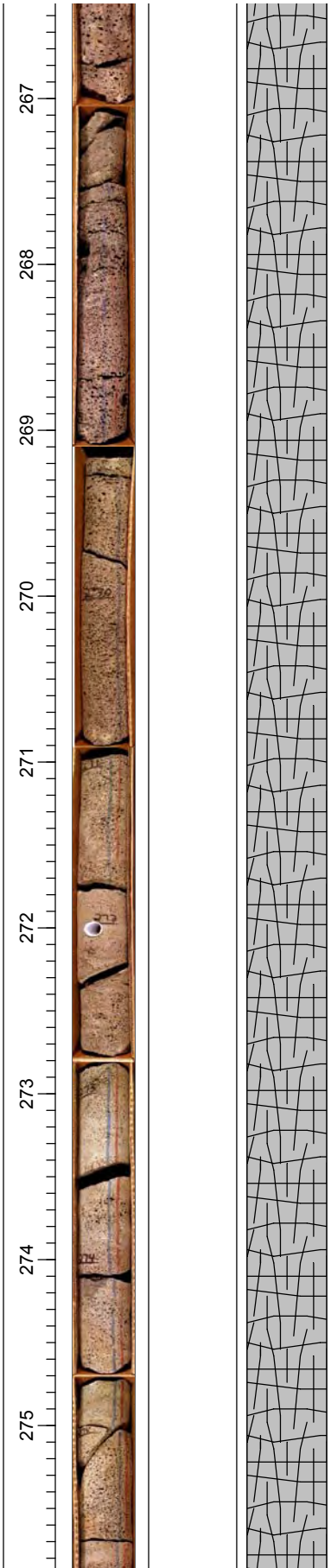




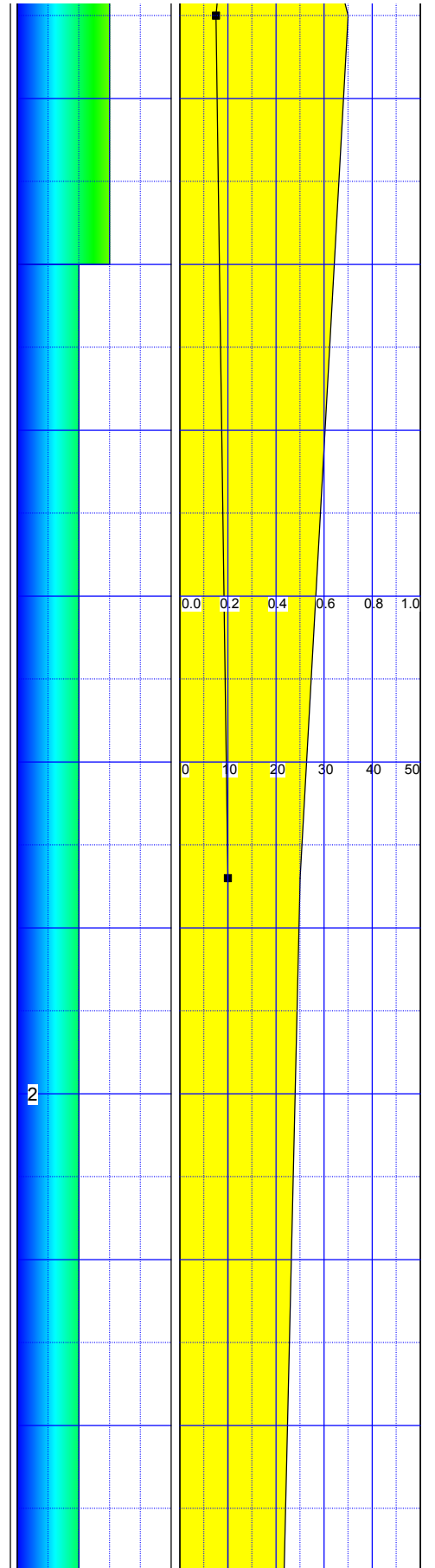


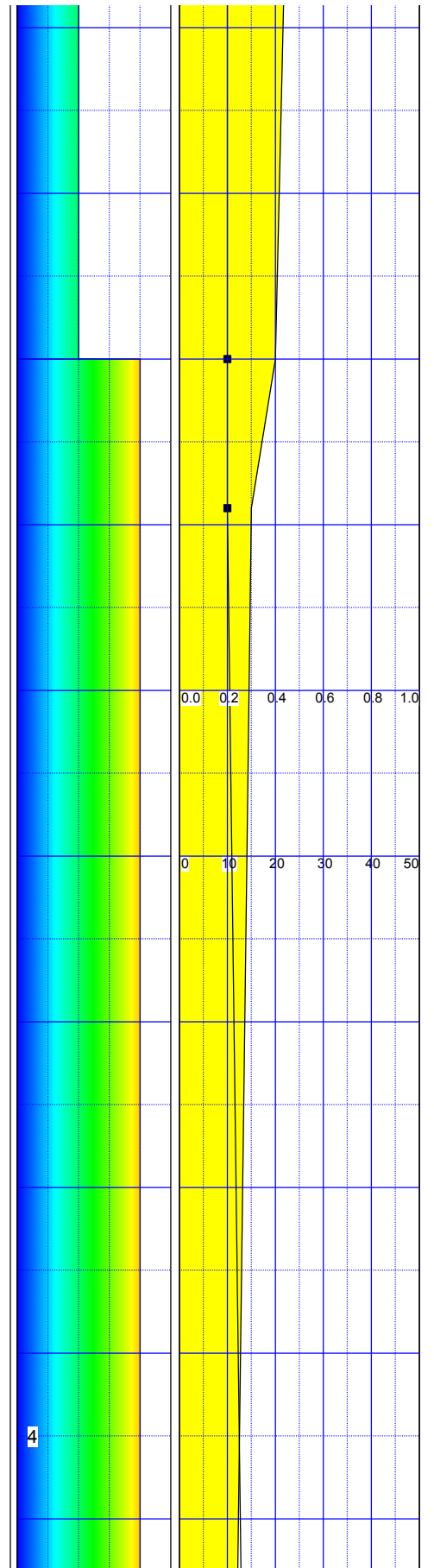
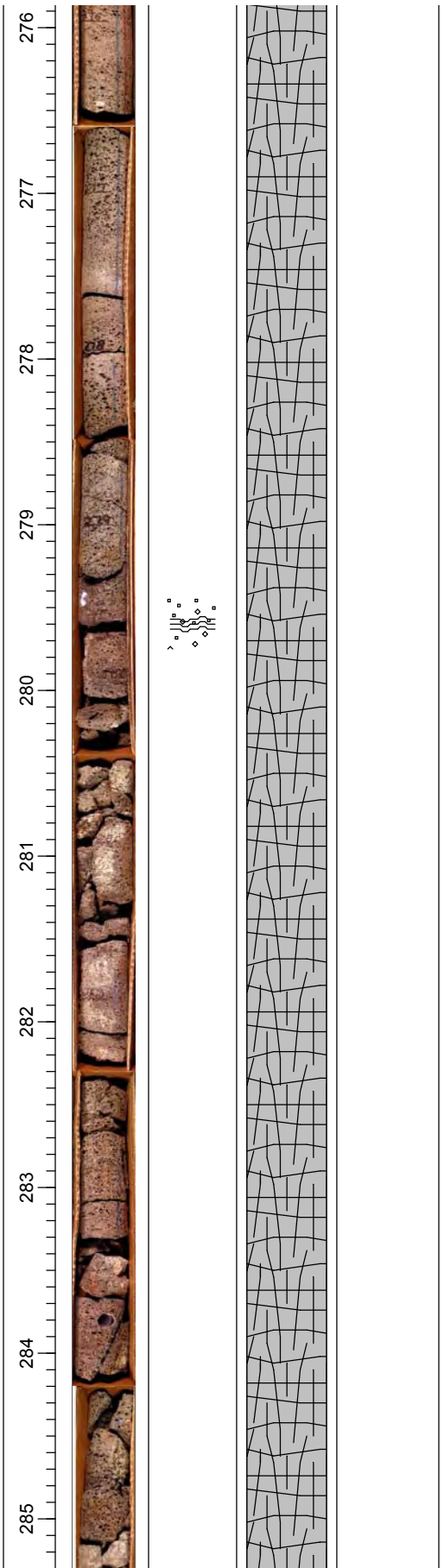
BASALT: COLOR: 5R 4/2 grayish red
 TEXTURE: Aphanitic, diktytaxitic, vesicular throughout, slightly more massive from 272 to 275 ft
 COMPOSITION: 3-7% < 0.5 mm anhedral olivine phenocrysts in a hypocrystalline matrix; flow/molds at 279.6 ft and at base of flow
 XENOLITHS / AUTOLITHS: No
 ALTERATION: Red alteration inside of all vesicles, and on flow/mold surfaces, whitish film on some fracture surfaces
 FREE CARBONATES: Yes, in 10YR 8/2 very pale orange very fine-grained sediment found in fractures at top, white film

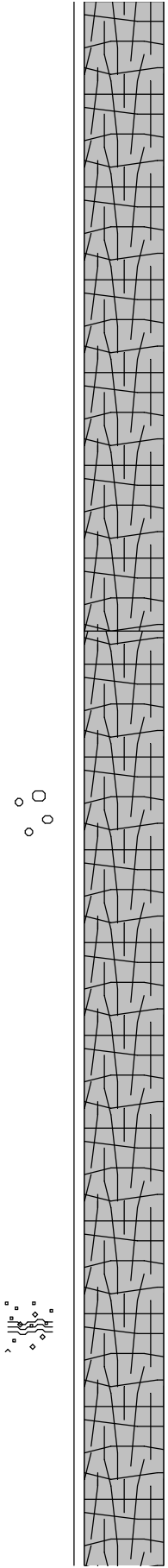




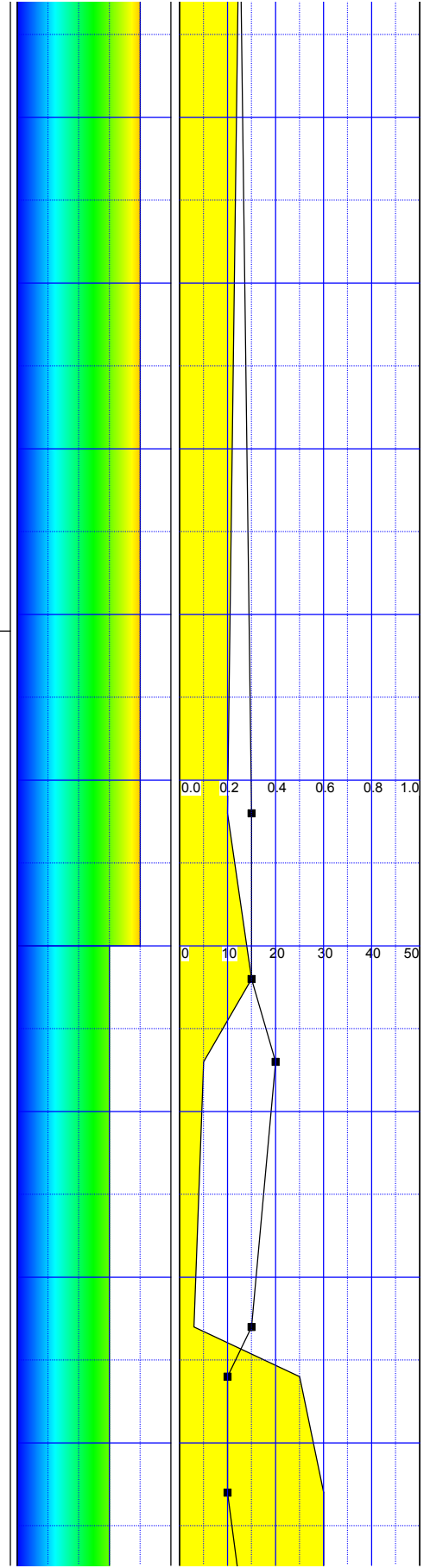
contains no free carbonate

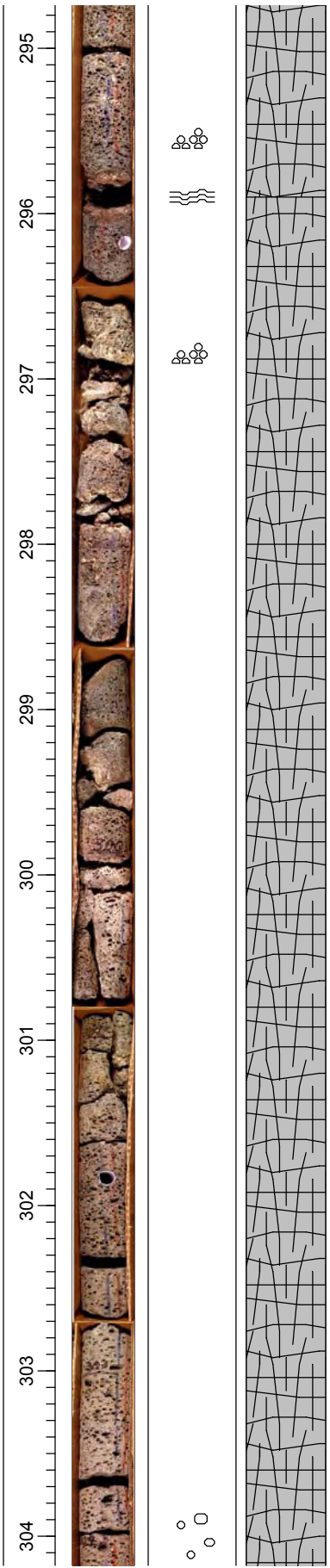




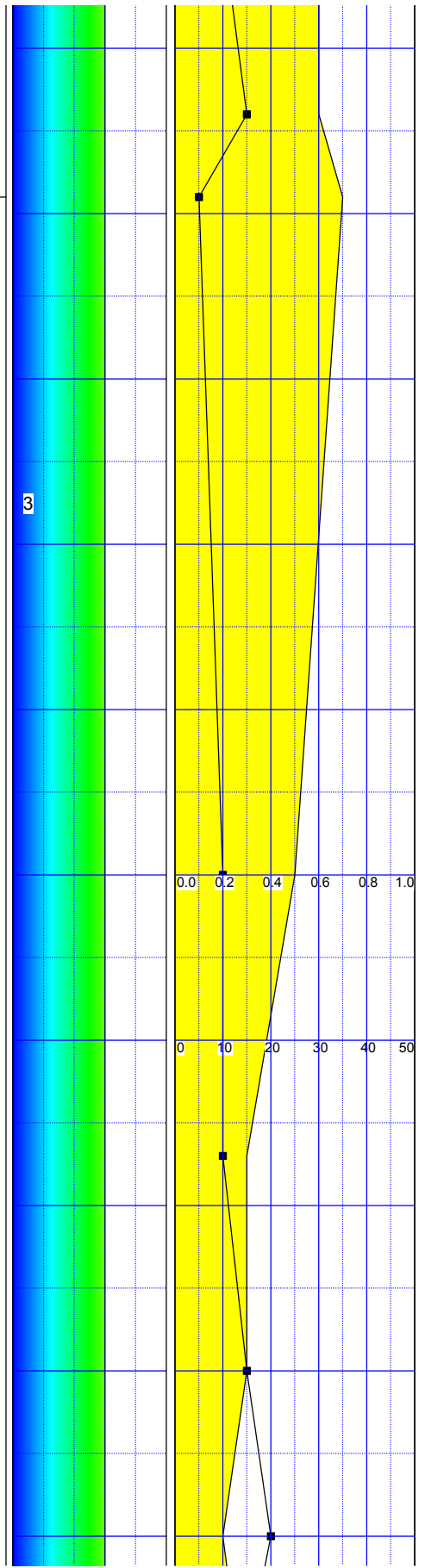


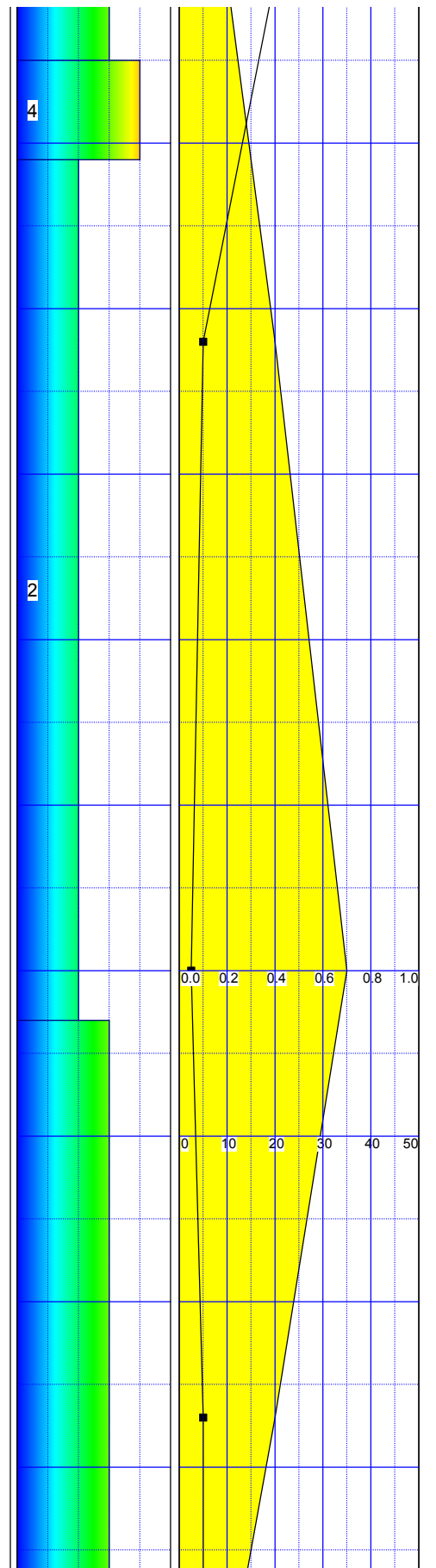
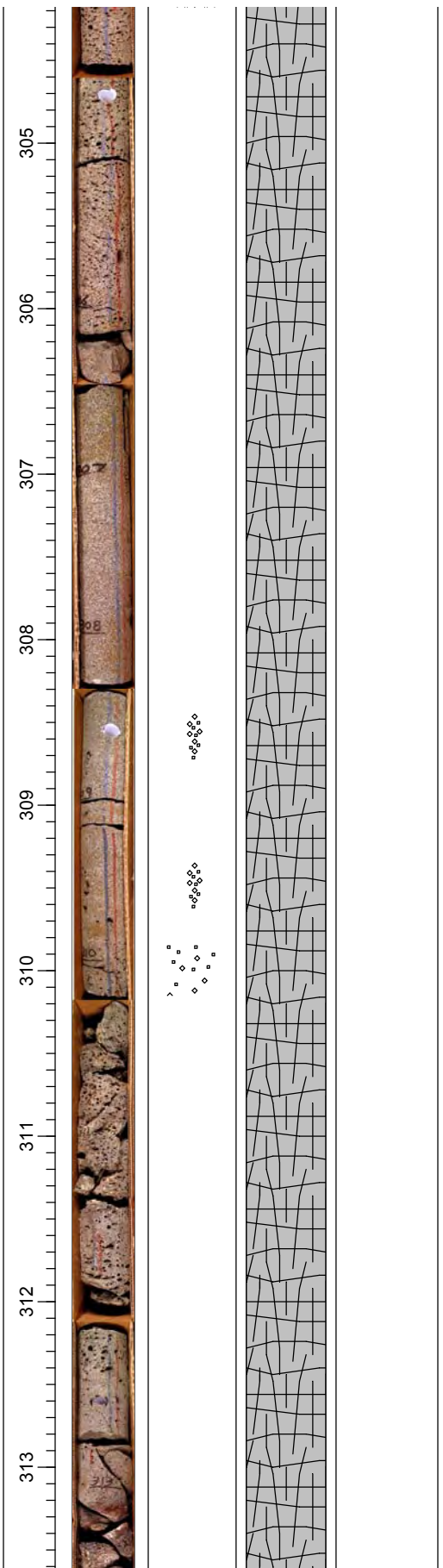
BASALT: COLOR: N4 dark gray basalt
 TEXTURE: Aphanitic, acicular plagioclase crystals and 1 mm euhedral olivine crystals in a hypocrySTALLINE matrix, flow/molds at base
 COMPOSITION: 3-5% 0.5-1 mm subhedral olivine phenocrysts in a hypocrySTALLINE matrix
 XENOLITHS / AUTOLITHS: No
 ALTERATION: Reddish oxidation on flow/mold surfaces at top and base
 FREE CARBONATES: Yes, in 10YR 8/2 very pale orange very fine-grained sediment found in fractures at top and base

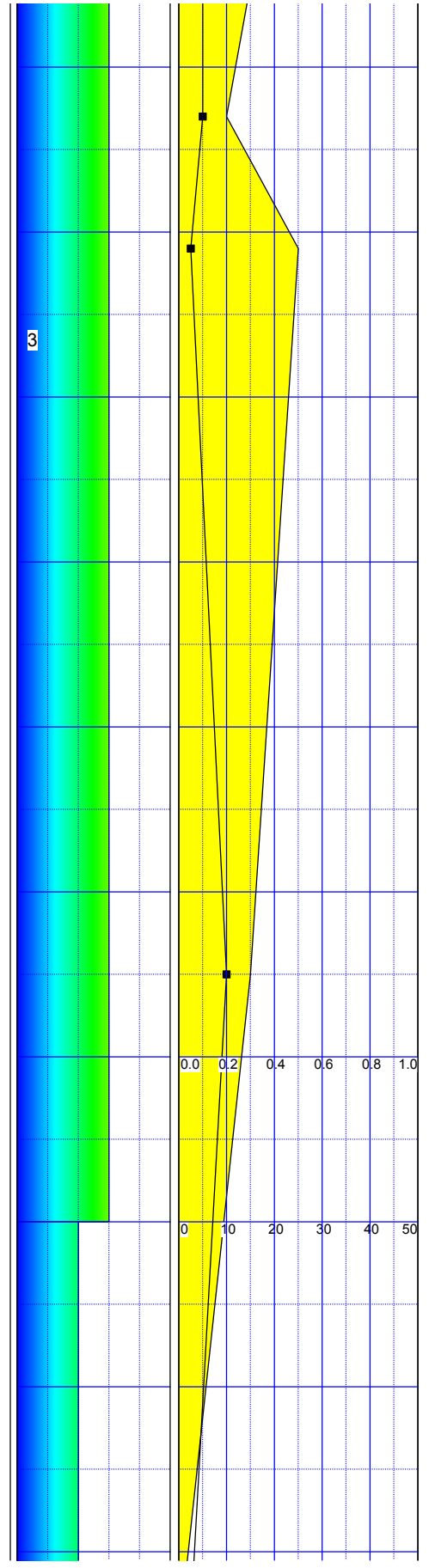
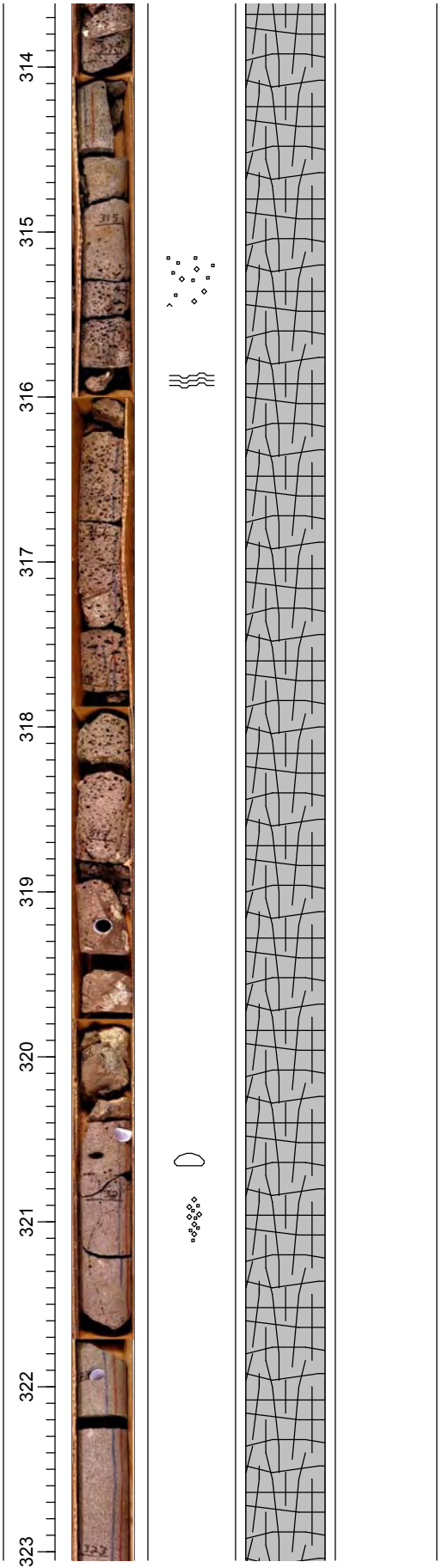


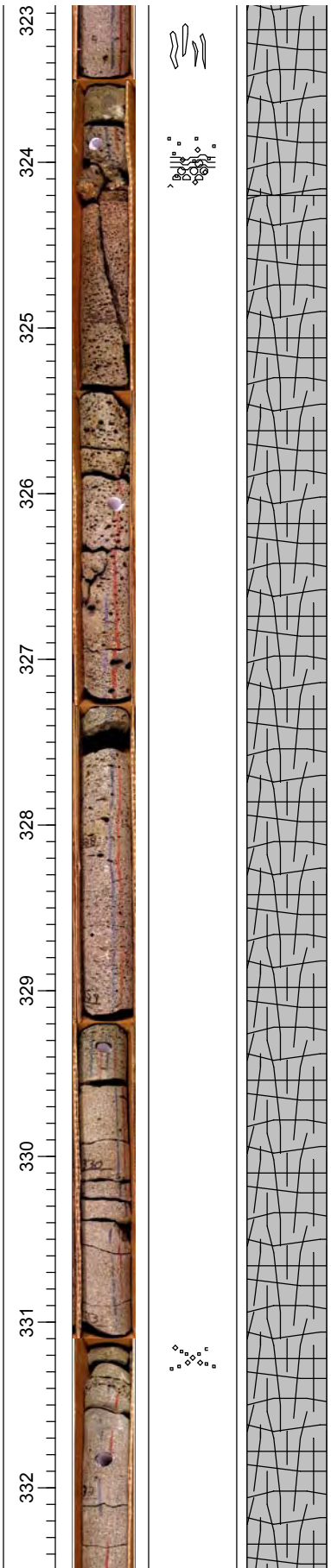


BASALT: COLOR: 5RP 4/2 grayish red purple at top, grading to N5 medium gray
 TEXTURE: Porphyritic-aphanitic, vesicular to massive basalt, diktytaxitic throughout.
 COMPOSITION: 15% anhedral to euhedral olivine phenocrysts in a hypocrySTALLINE plagioclase-rich matrix, acicular plagioclase crystals < 1 mm, olivine crystals 0.5-1 mm in vesicular zones, olivine crystals larger, less altered, in massive zones, and some larger agglomerations of olivine in those areas
 XENOLITHS / AUTOLITHS:
 ALTERATION: Reddish oxidation inside vesicles, olivine crystals have red alteration more pronounced at top and in vesicular zones
 FREE CARBONATES: In sediment at top

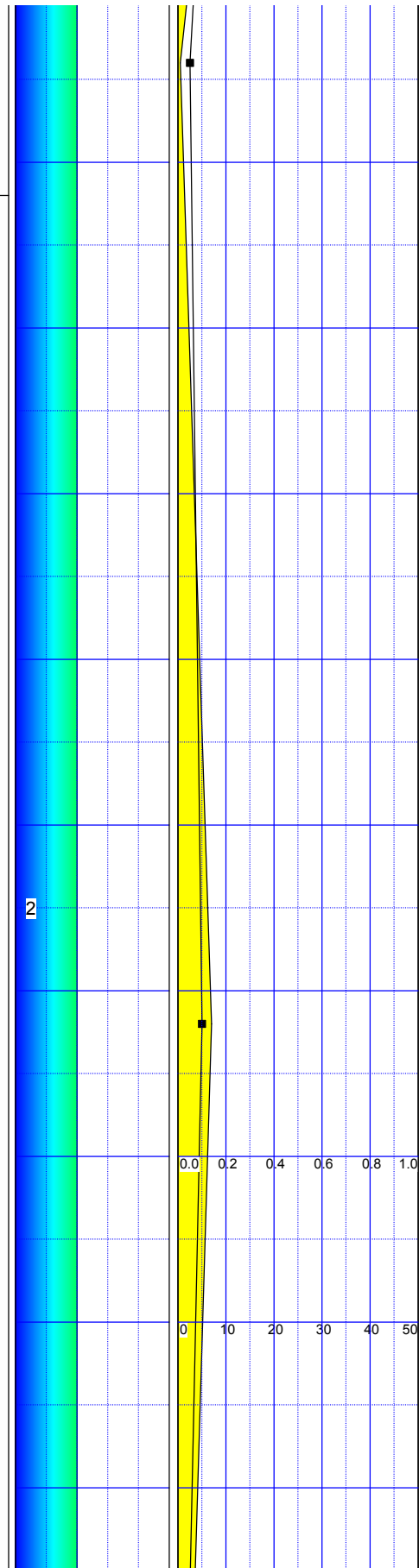


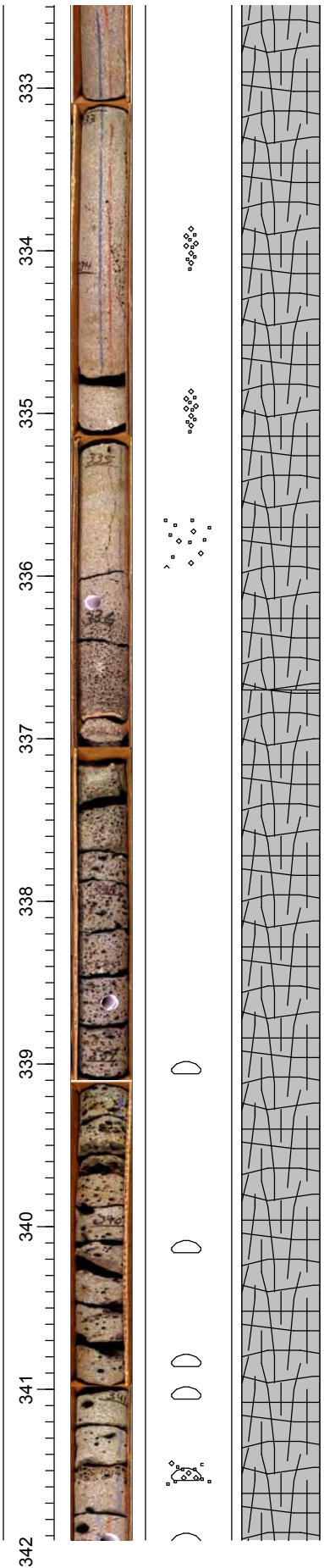




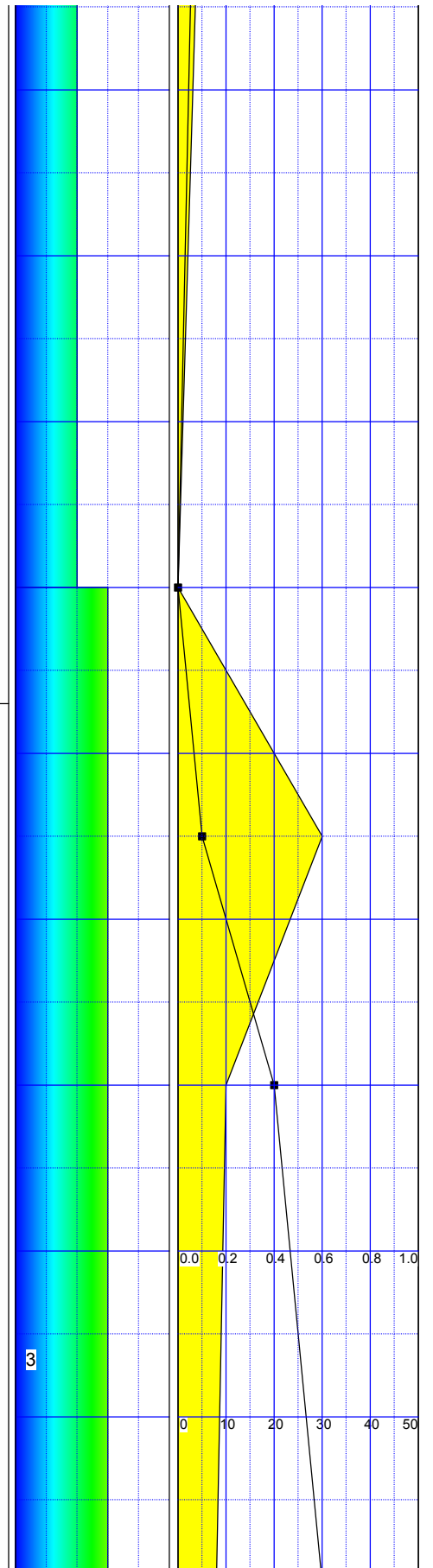


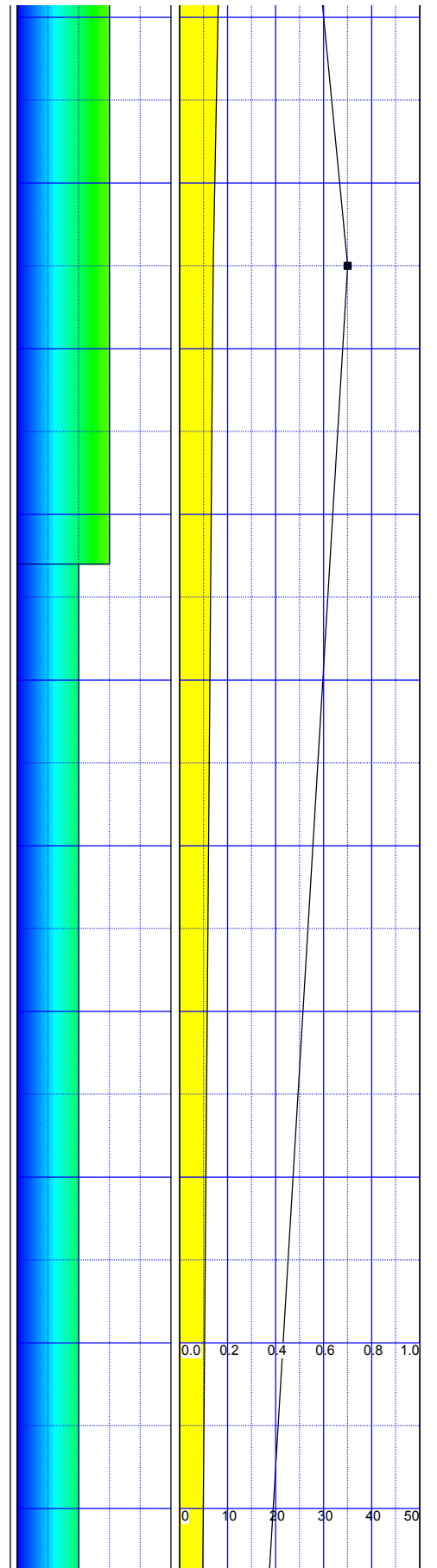
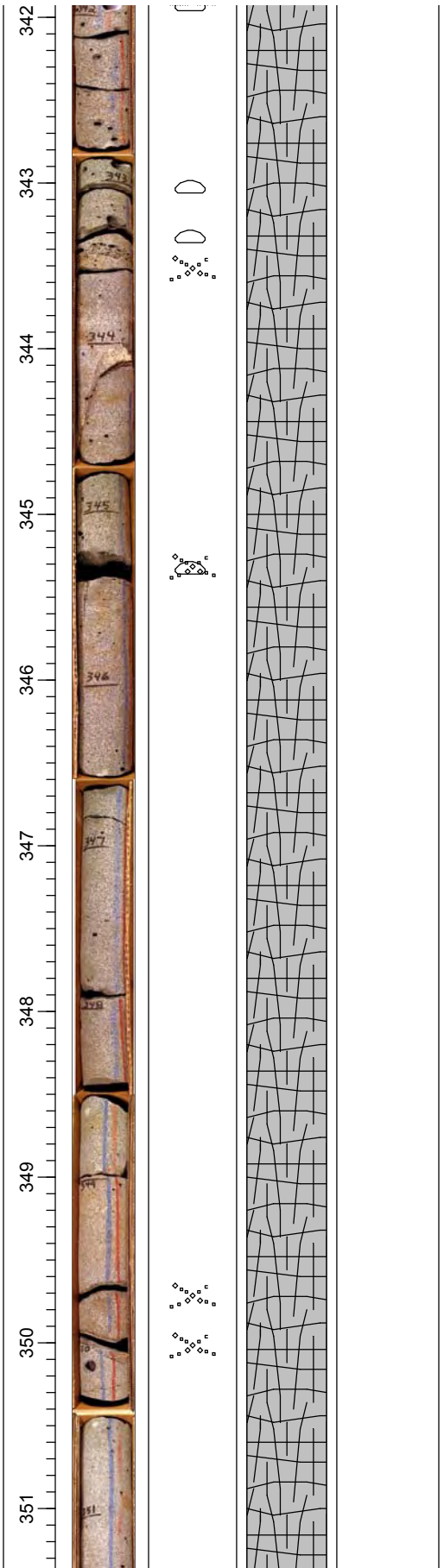
BASALT: COLOR: 5R 4/2 grayish red to N4 medium dark gray basalt
TEXTURE: Aphanitic, porphyritic basalt. Vesicular from top to 329.2 ft, massive to 335.9 ft, vesicular to base, diktytaxitic throughout
COMPOSITION: 15% 1-2 mm subhedral olivine phenocrysts in a hypocrySTALLINE matrix
XENOLITHS / AUTOLITHS: No
ALTERATION: No
FREE CARBONATES: No

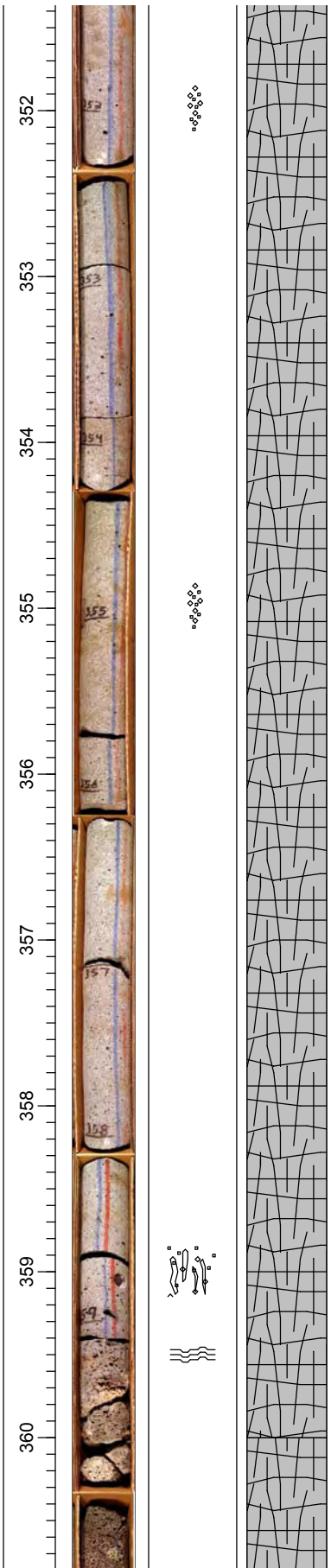




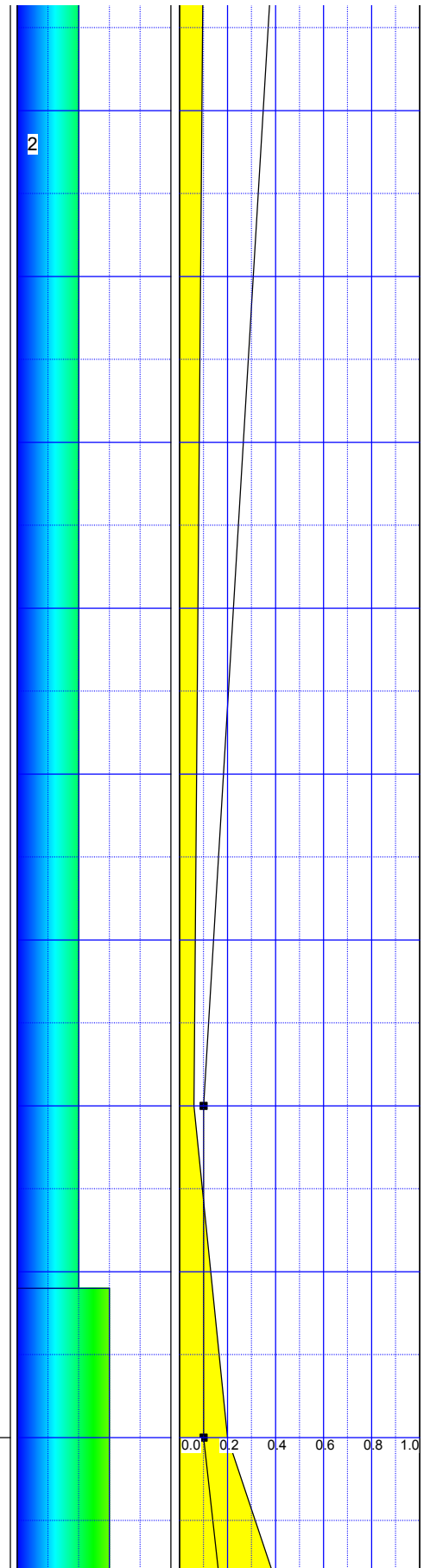
BASALT: COLOR: N4 medium dark gray
 TEXTURE: Fine-grained, holocrystalline porphyritic basalt, vesicles decrease in number and increase in size from top to 344.7 ft, then massive from 344.7 ft to 358 ft, increasingly vesicular to base, diktytaxitic throughout
 COMPOSITION: 25-35% 1-2 mm olivine in a 75-65% plagioclase framework matrix. Plagioclase crystals are approaching lath shape, randomly oriented
 XENOLITHS / AUTOLITHS: Autoliths at 340.6 ft, 341.5 ft, 343.5 ft, 355 ft

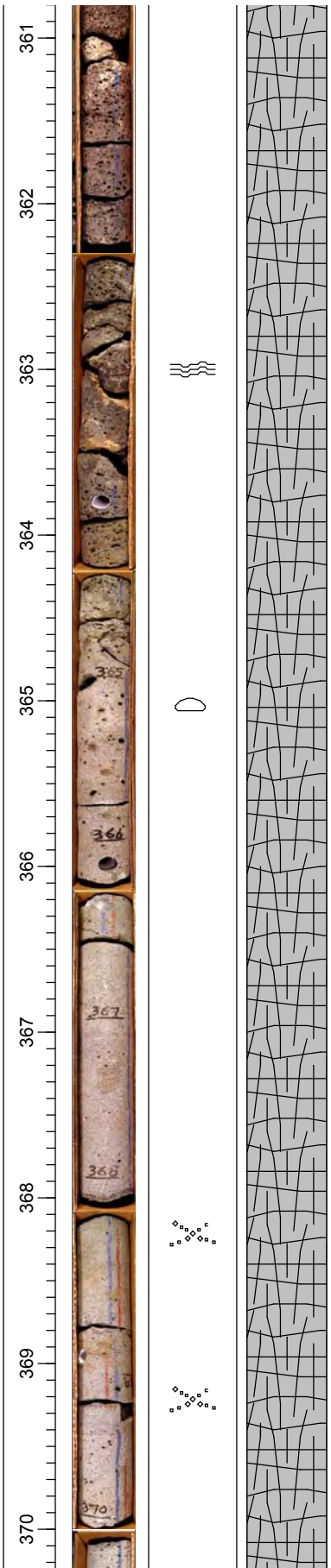




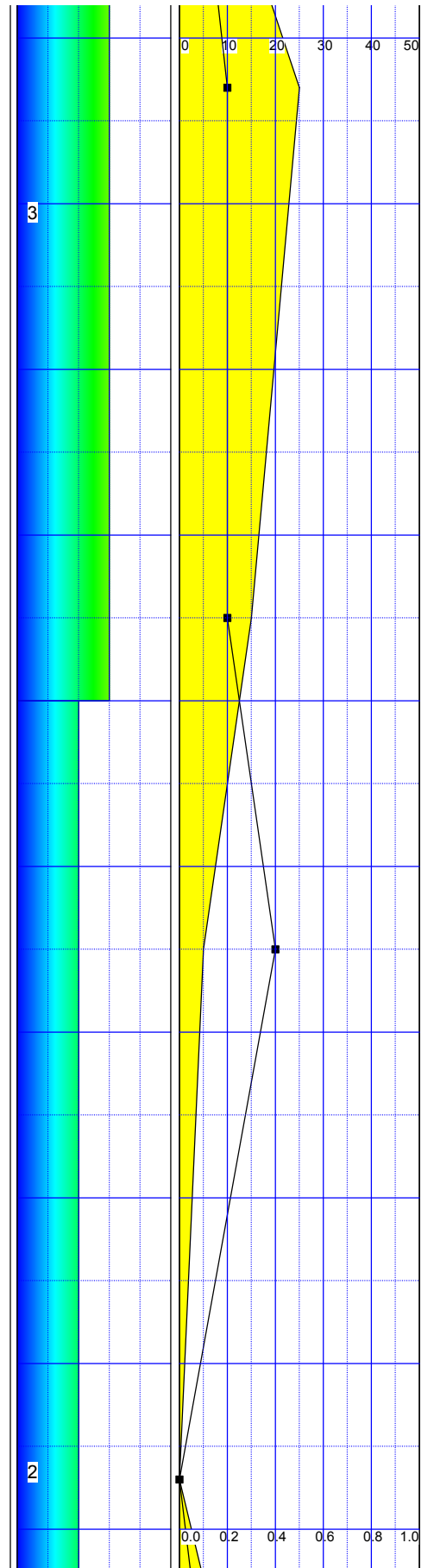


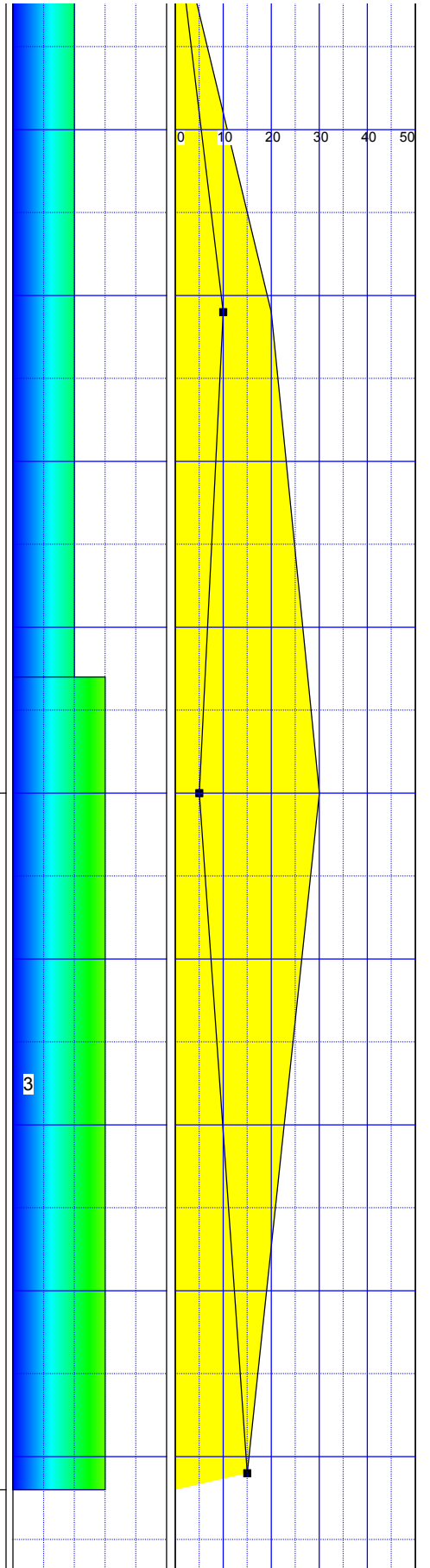
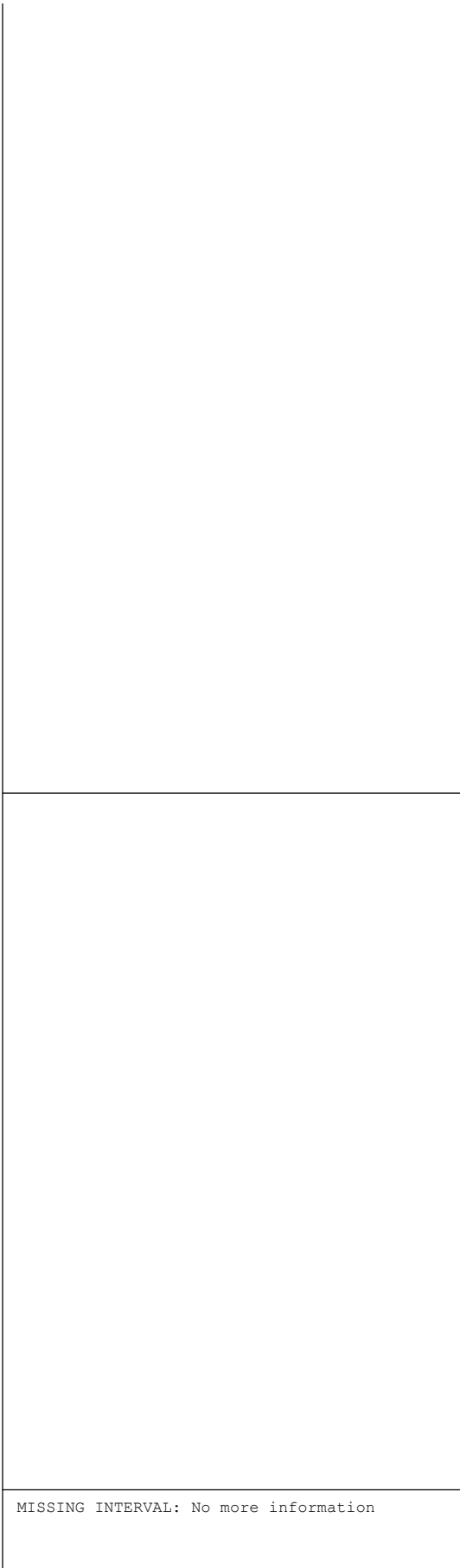
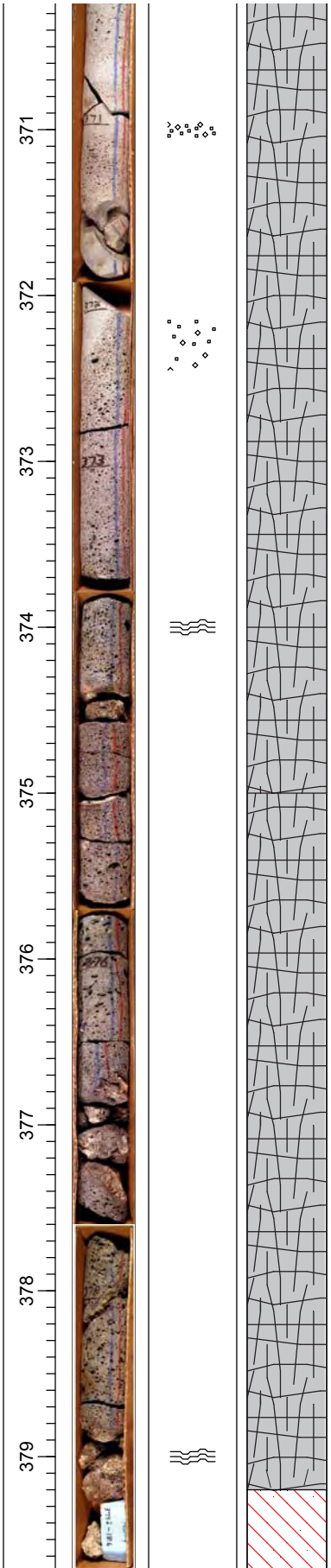
BASALT: COLOR: 5R 4/2 grayish red to 362.3 ft, then grading to N4 medium dark gray
 TEXTURE: Microporphyrific, fine-grained, holocrystalline basalt. Vesicular from top to 366 ft, vesicles increase in size and decrease in number with depth, then massive to 370 ft, then increasingly vesicular to

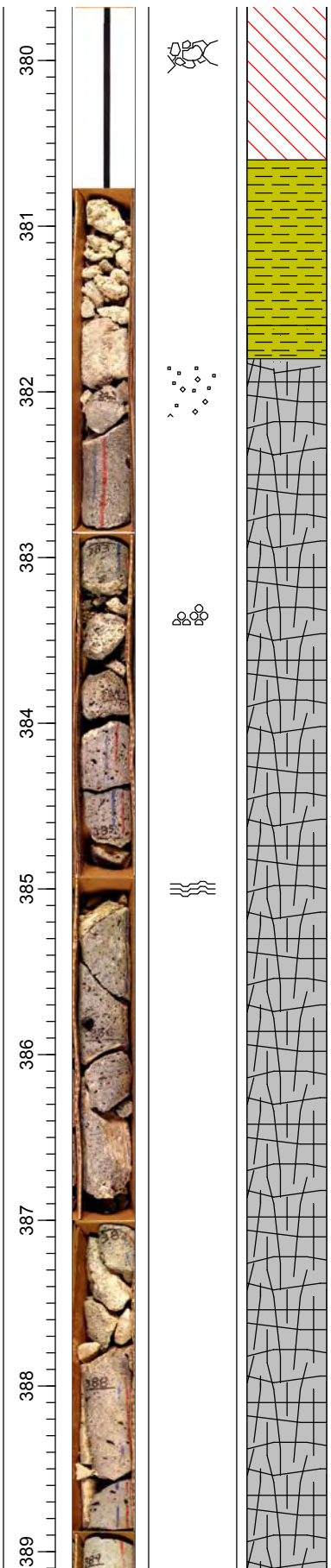




base.
COMPOSITION: 30% 0.5-1mm olivine phenocrysts
in a felted plagioclase matrix
XENOLITHS / AUTOLITHS: No
ALTERATION: Top has reddish alteration
around vesicles, base darkens to N3 dark
gray
FREE CARBONATES: Sediment on fracture
surfaces has free carbonates

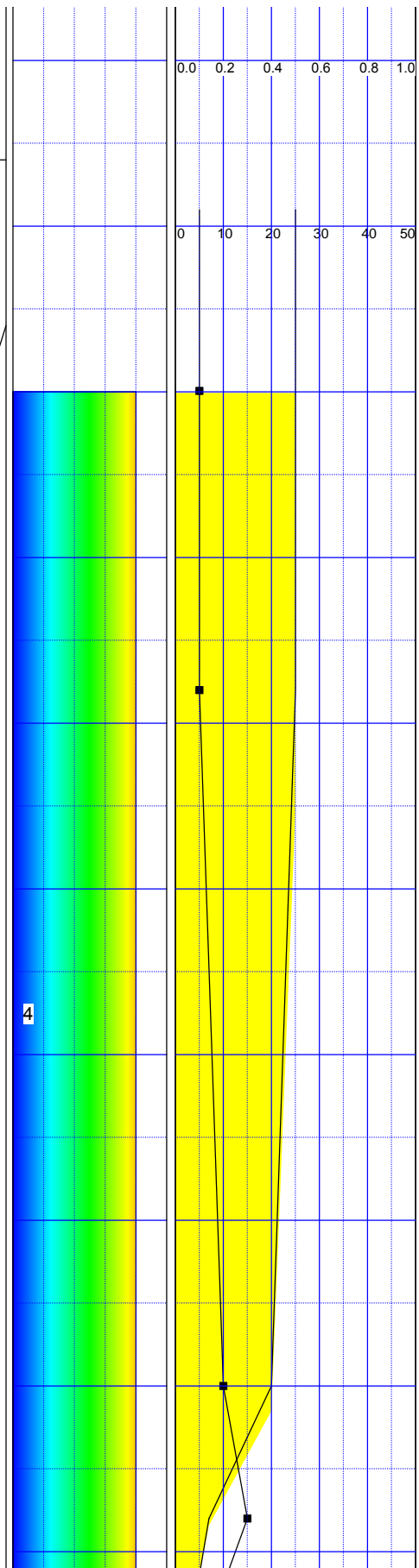


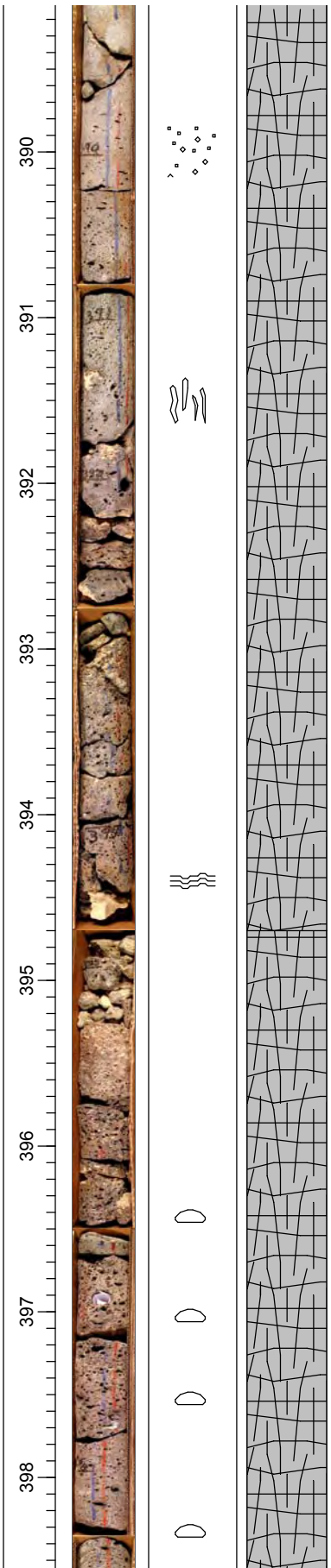




SILT AND CLAY: TEXTURE: ML
 COLOR: 10YR 8/2 very pale orange
 CONSISTENCY: Very hard
 STRUCTURES: Blocky
 FREE CARBONATES: Yes
 ROCKS: Basalt clasts
 ROOTS/FOSSILS: None observed

BASALT: COLOR: N3 dark gray basalt
 TEXTURE: Aphanitic hypocrySTALLINE basalt
 COMPOSITION: 10% anhedral olivine
 phenocrysts in a dark gray groundmass
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: None noted
 FREE CARBONATES: In sediment on fracture
 surfaces and in vesicles





BASALT: COLOR: N5 medium gray
 TEXTURE: Porphyritic-aphanitic,
 glomeroporphyritic, granular, vesicular from
 top to 409.6 ft massive from 409.6 ft to
 base, diktytaxitic throughout
 COMPOSITION: 35% subhedral to euhedral
 olivine phenocrysts in hypocrySTALLINE
 matrix.
 XENOLITHS / AUTOLITHS: None observed
 ALTERATION: None observed

