

## **Appendix A. Core Logs for Borehole USGS 136 (0–1,048 ft BLS)**



**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:  
Linda C. Davis  
PO Box 8072  
Pocatello, ID.  
83209

**Official Name:** USGS 136

Logged By: Michael Ginsbach

Selected Aliases: None

USGS Site ID: 433447112581501

Contractor Well ID: N/A

Drilling Agency: USGS

Year Drilled: 2010

Names of Drillers: M. Gilbert and J. Blom

Well Status: Complete

Total Depth of Hole (ft): 1,048

Total Core Recovered (ft): 1000

Beginning Depth (ft): 0

Ending Depth (ft): 1,048

Continuous Recovery

Selected Intervals Recovered

Notes:

County & State: Butte Co., ID

Quadrangle Name: Circular Butte

Lat / Lng: N43° 34' 47.72" W112° 58' 12.00"

Tns / Rng / Sec: R29E T02N S23

UTM Coordinates: 340940.752 4826887.170, Zone 12N

Surface Elevation (ft): 4,935.00

## Core Geological Profile

**Lithologic Patterns**

-  Basalts
-  Rhyolites
-  Sedimentary Rock

**Soil Patterns** (See Unified Soil Classification System.)

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

**Intervals in Absentia**

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

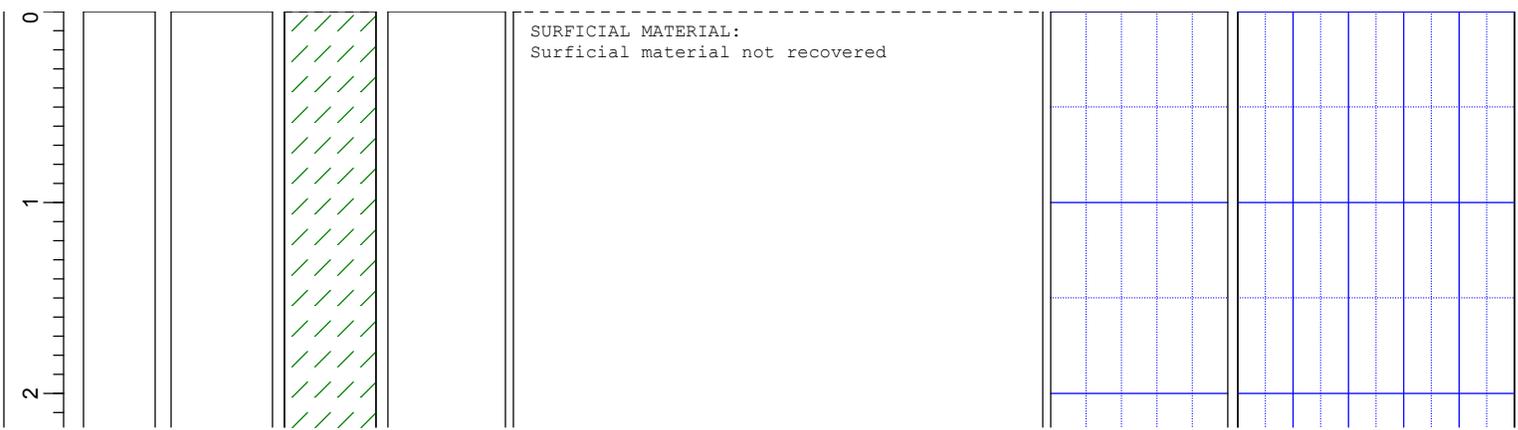
**Igneous and Sedimentary Structure Symbols**

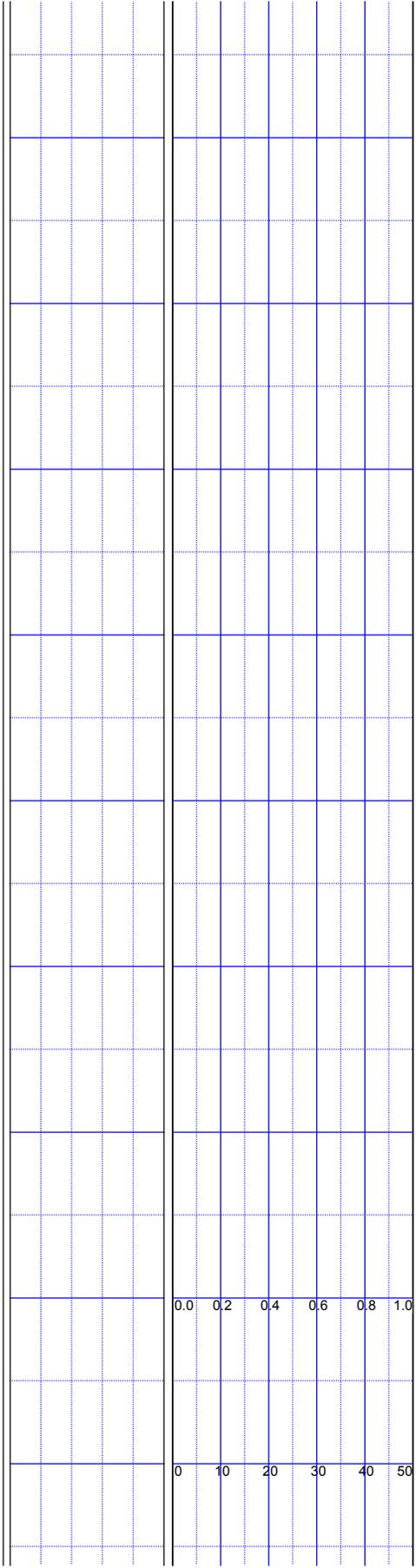
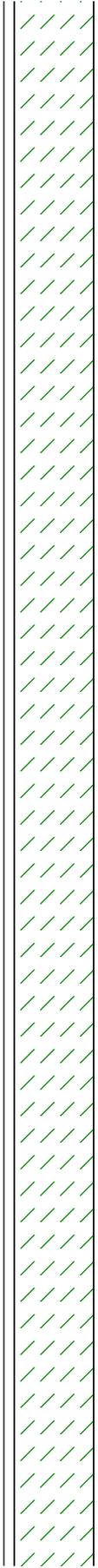
-  Vesicle zone
-  Large vesicles
-  Vesicle planes
-  Mega vesicles
-  Vesicle Cylinders
-  Pipe vesicles
-  Pillows
-  Vesicle Sheet
-  Flow/Mold
-  Spatter feature
-  Ripple marks
-  Mud cracks
-  Imbricated bedding
-  Graded bedding
-  Cross bedding

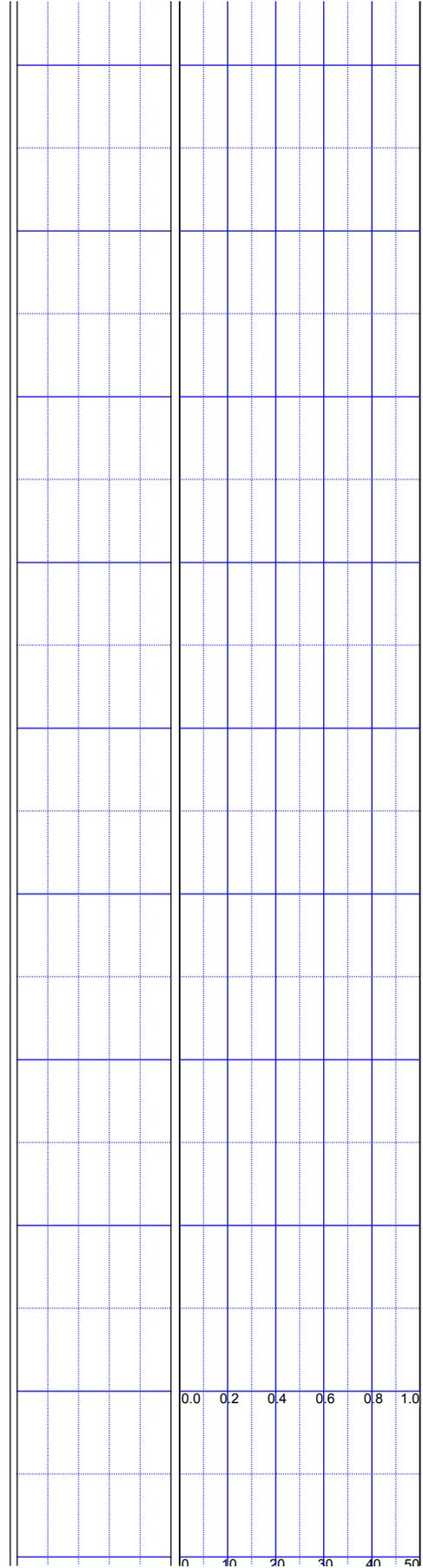
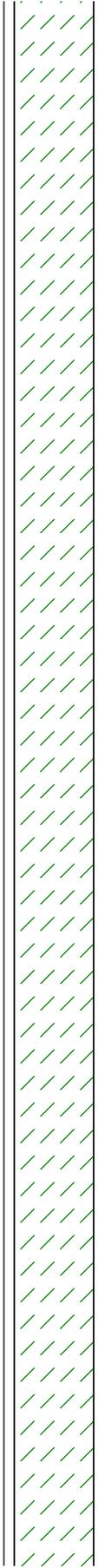
**Soil Structure Symbols**

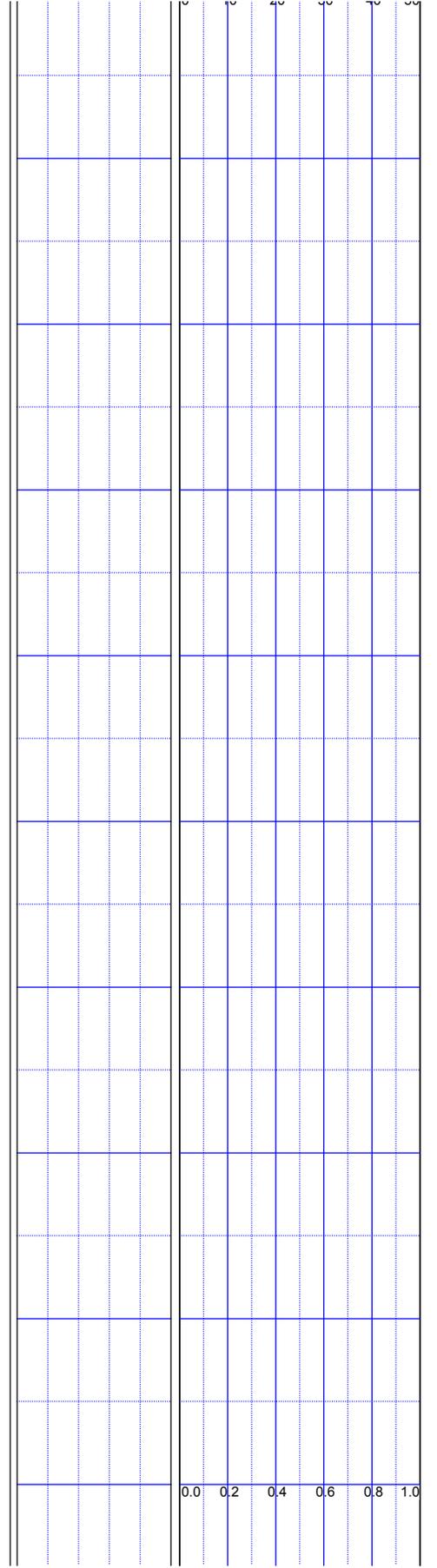
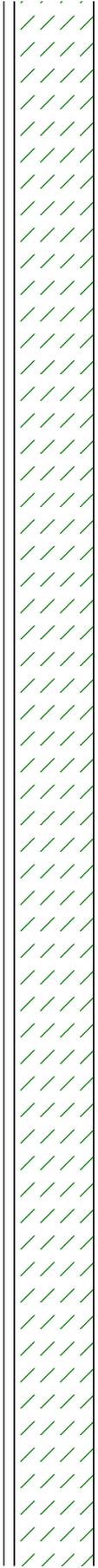
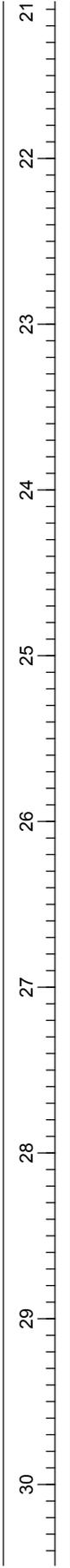
-  Structureless - Single Grained
-  Structureless - Massive
-  Platy
-  Granular
-  Blocky
-  Prismatic
-  Columnar

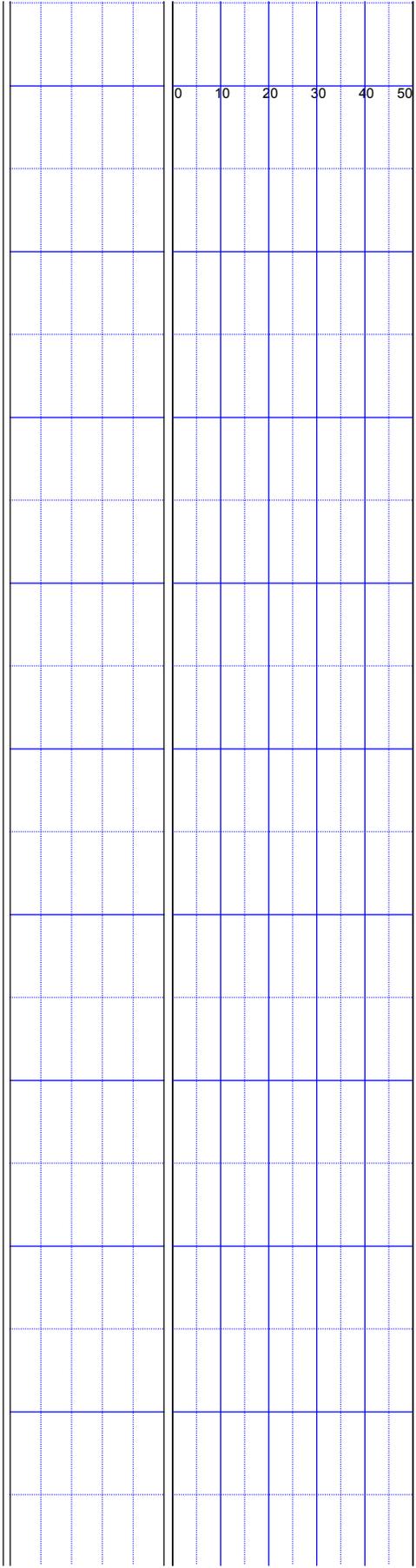
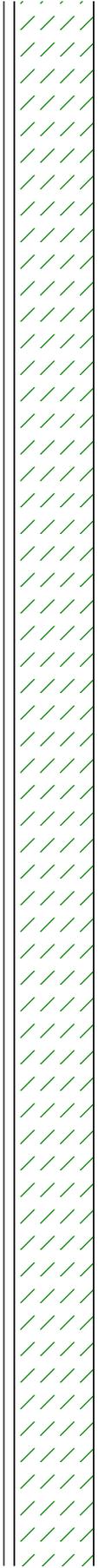
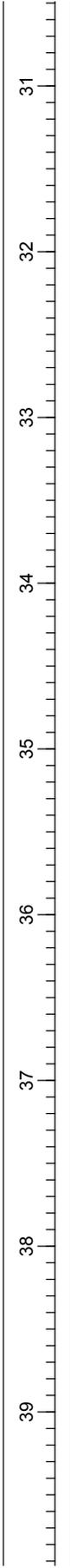
Depth (feet & tenths)	Core Photo	Igneous, Soil and Sed Structures	Lithology	Description	Fracture Frequency (See fracture classification on website.)	Vesicle Characteristics
				Miscellaneous Text   Lithologic Description	0 1 2 3 4 5	Mean Size (in) 0 0.2 0.4 0.6 0.8 1.0 Volume Percentage 0 10 20 30 40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

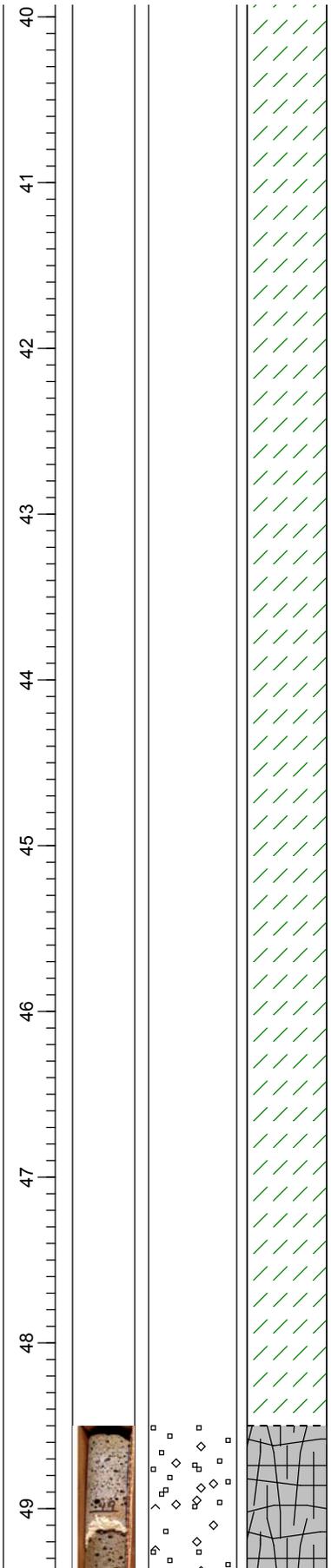




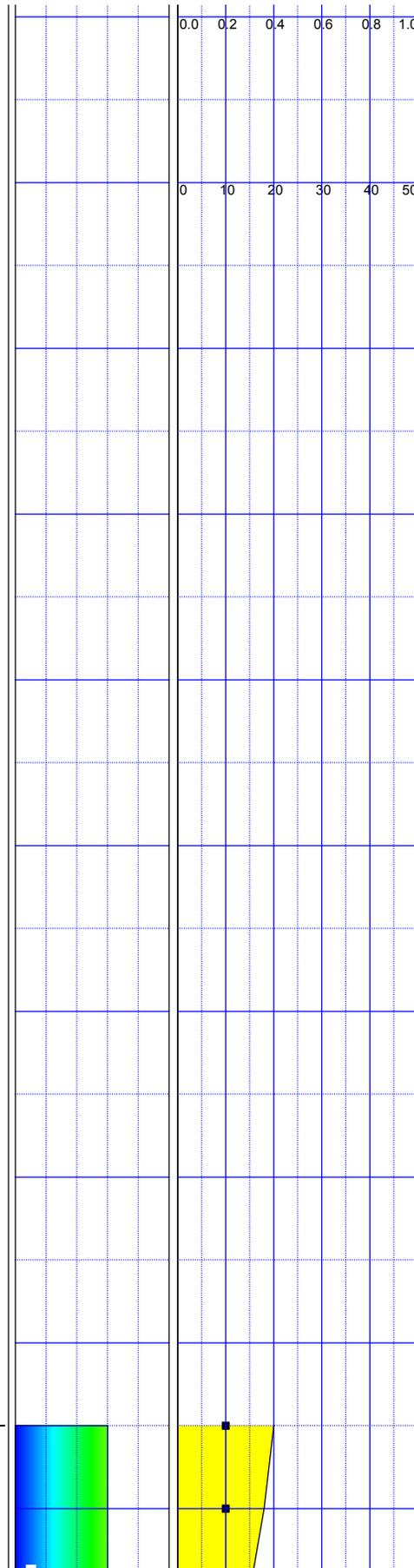


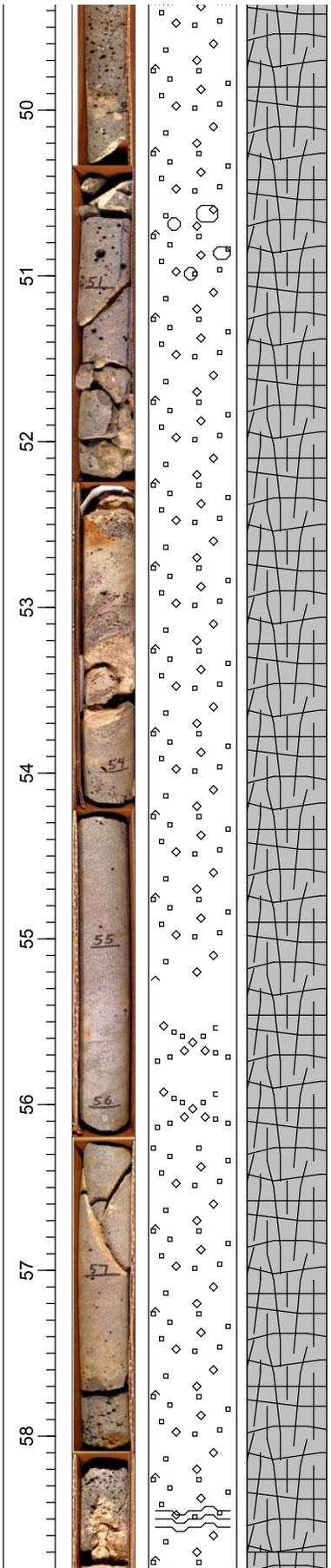






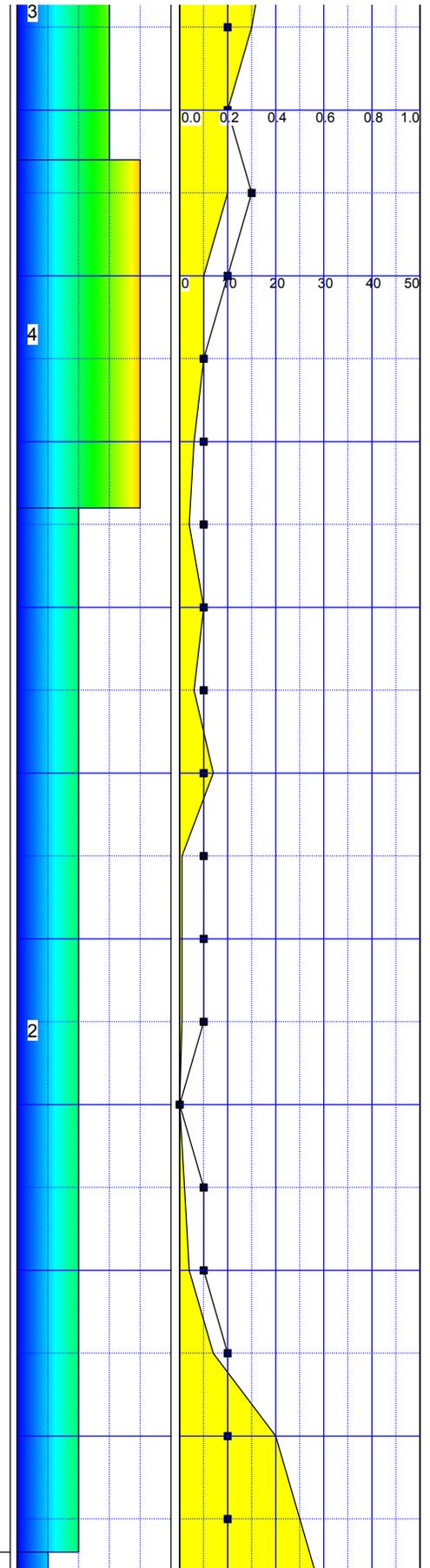
BASALT:  
 COLOR: N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular, diktytaxitic basalt; decreasingly vesicular from 48.5 feet to 57.5 feet and vesicular from 57.5 feet to 58.7 feet, diktytaxitic from 54.2 feet to 57.5 feet with rare vesicles, vesicle planes at 55.6 and 56.0 feet, large

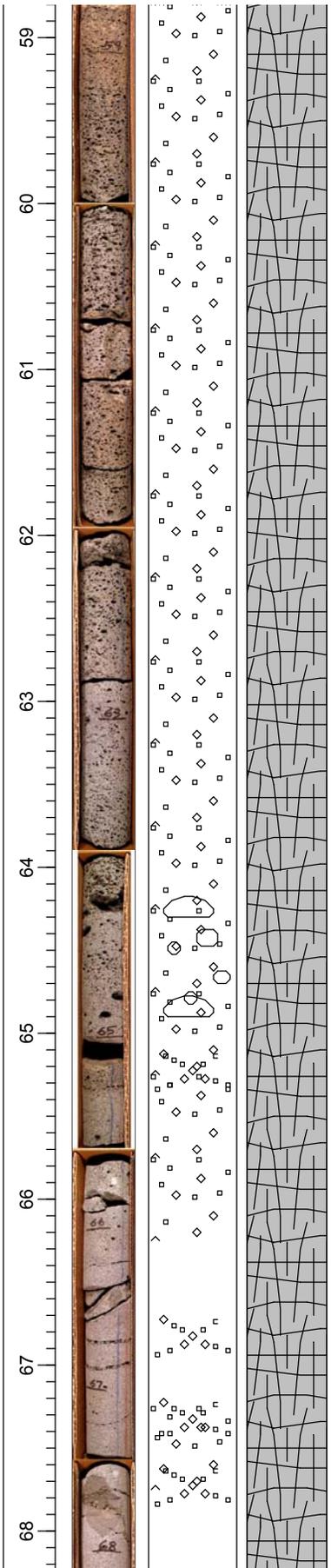




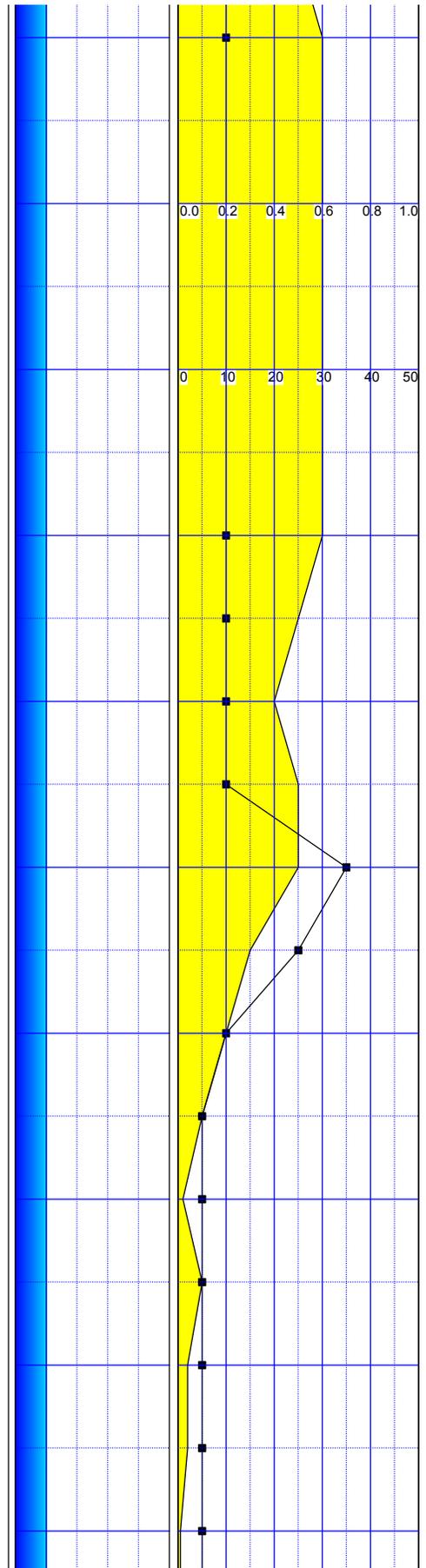
vesicles at 50.8 feet  
COMPOSITION: 40% plagioclase, 25% olivine, 35% groundmass with few less than 1 mm pyroxene; sub millimeter to rare 1 mm plagioclase laths, anhedral to subhedral sub millimeter to rare 2 mm olivine microcrysts and glomerocrysts, sub millimeter subhedral to euhedral pyroxenes  
XENOLITHS/AUTOLITHS: Autoliths rare 57.8 feet  
ALTERATION: 10YR 8/2 Very Pale Orange calcitic mud in natural fractures, calcite occurs in some vesicles, very slight alteration of olivine to iddingsite, flow and mold structure at base

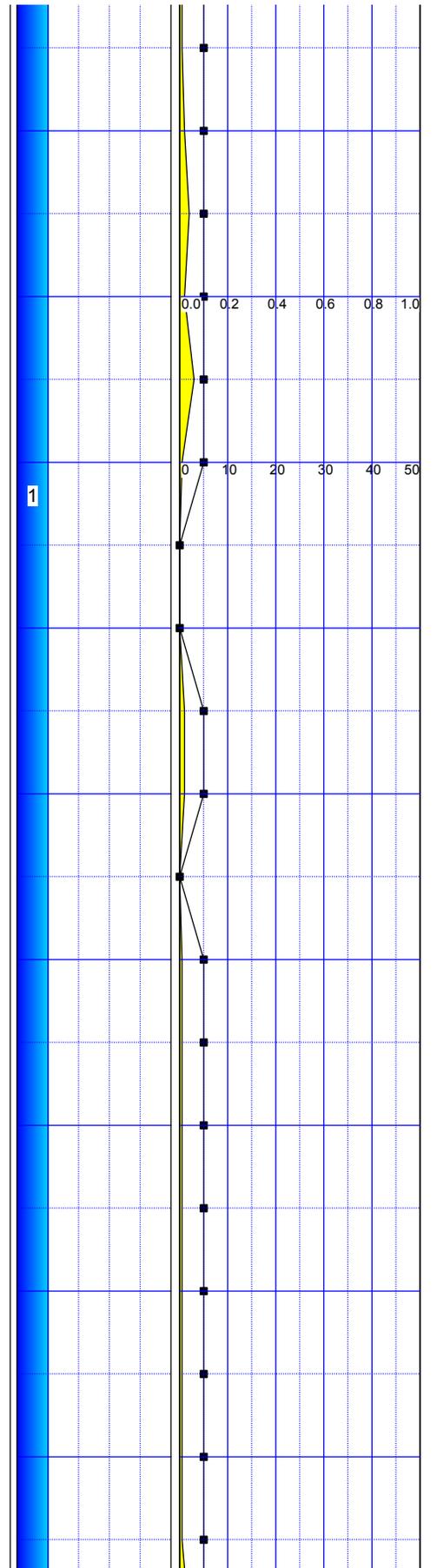
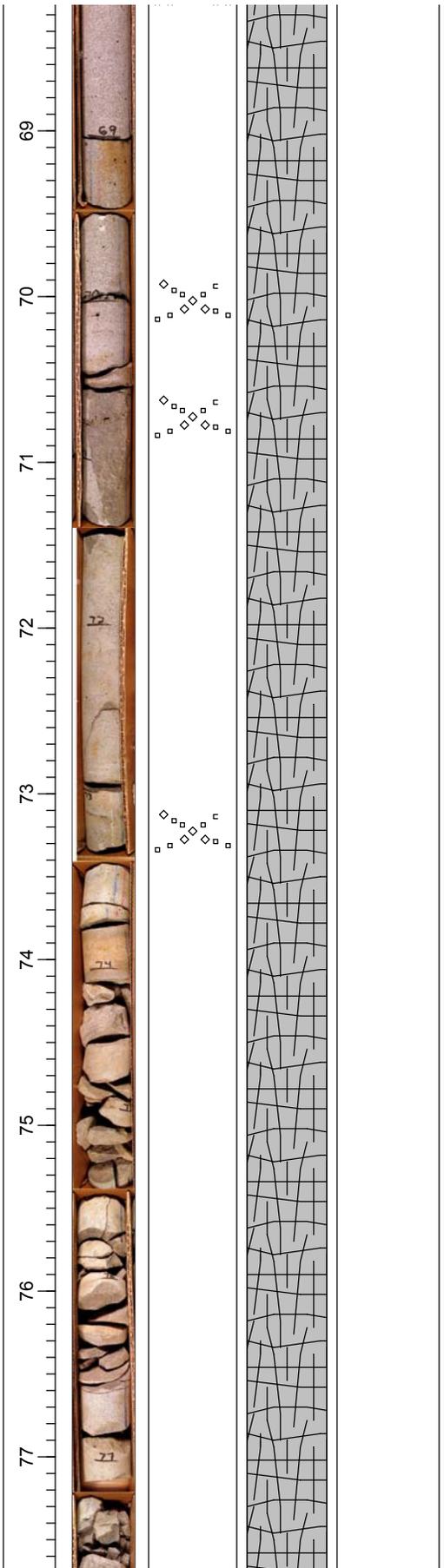
BASALT:

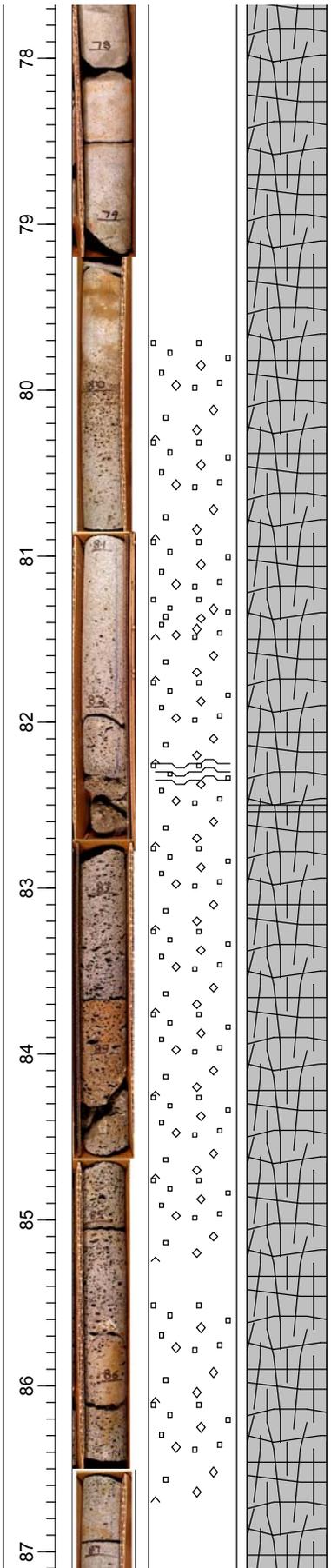




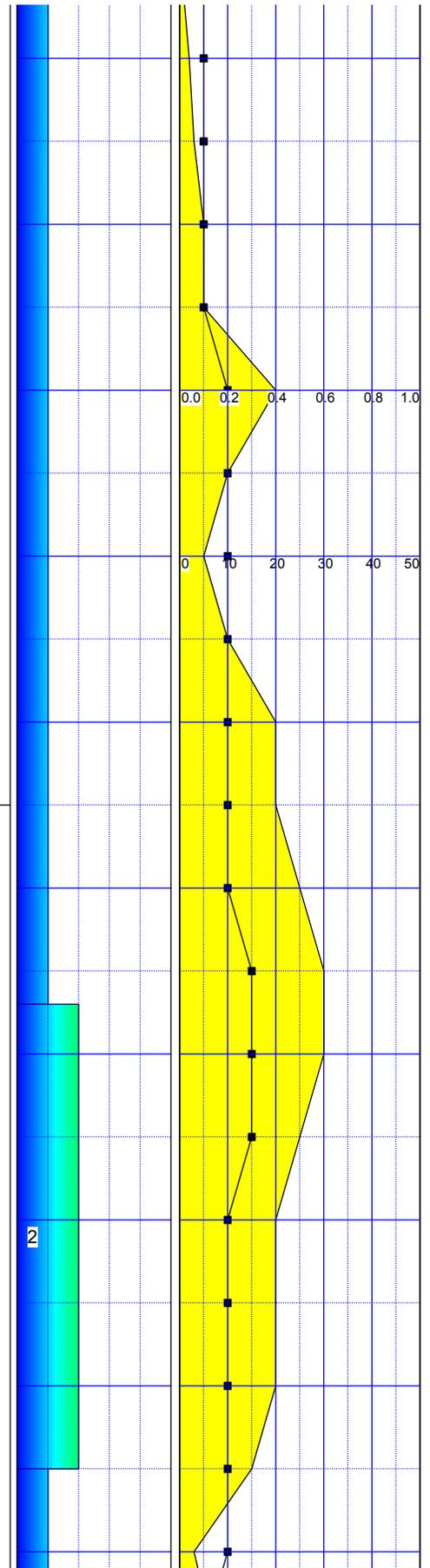
COLOR: N5 Medium Gray to N6 Medium Light Gray  
 TEXTURE: Mostly aphanitic, vesicular, massive, diktytaxitic basalt; decreasingly vesicular from 58.7 feet to 68.0 feet and vesicular from 79.7 feet to 82.5 feet, diktytaxitic from 66.0 feet to 70.2 feet with rare vesicles, massive from 70.2 feet to 79.7 feet, vesicle planes common from at 65.2 to 70.8 feet, rare megavesicles at 64.2 feet and 64.8 feet, large vesicles at 64.6 feet  
 COMPOSITION: 35% plagioclase, 15% olivine, 50% groundmass with few pyroxene; submillimeter to 1 mm plagioclase laths, anhedral to subhedral submillimeter to rare 2 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 Very Pale Orange calcitic mud in natural fractures in upper section of interval, moderate alteration of olivine to iddingsite, flow and mold structure at base

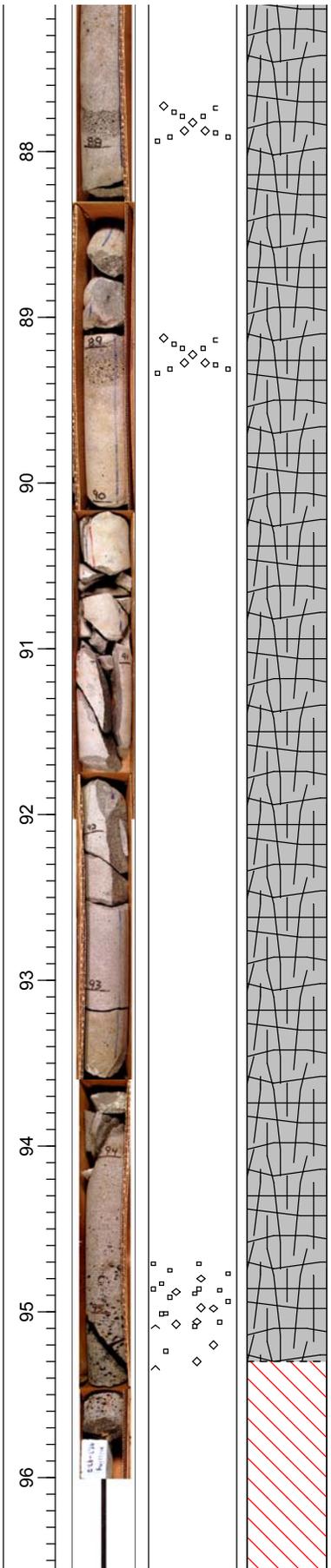




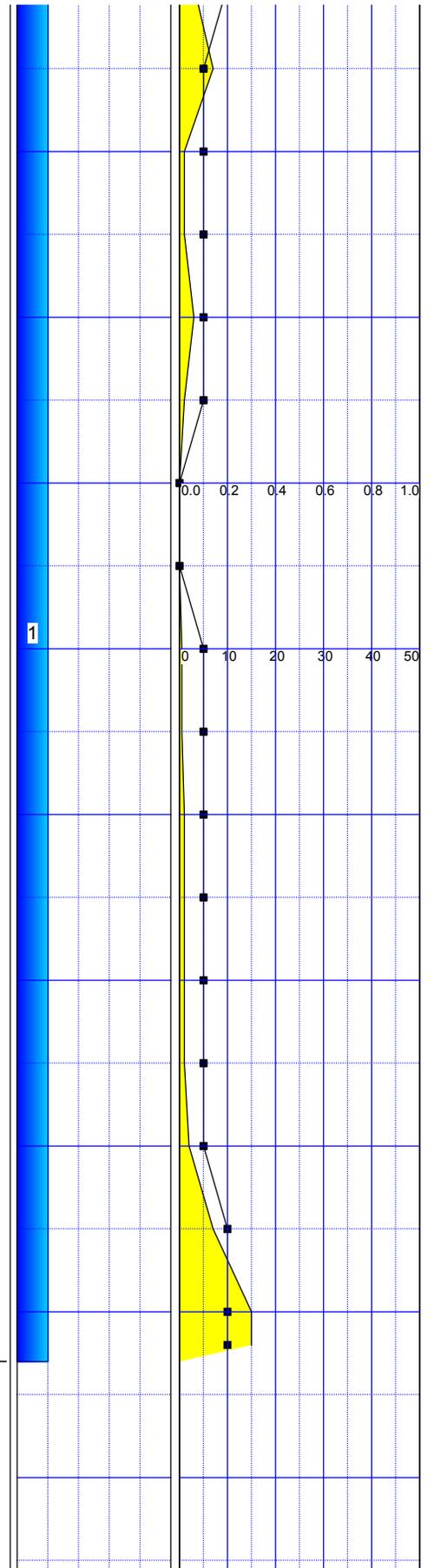


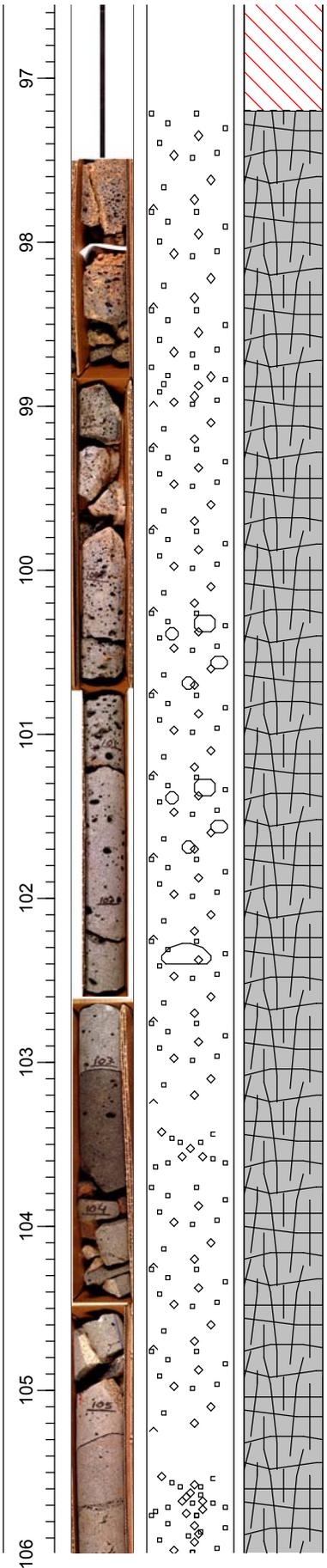
BASALT:  
 COLOR: N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular, massive basalt; vesicular from 82.5 feet to 86.7 feet and from 94.7 feet to 95.6 feet, massive from 86.7 feet to 94.7 feet, vesicle planes at 87.8 to 89.2 feet  
 COMPOSITION: 35% plagioclase, 20% olivine, 45% groundmass; submillimeter to rare 1 mm plagioclase laths, anhedral to subhedral submillimeter to rare 2 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange calcitic mud in some vesicles in upper section of interval, slight alteration of olivine to iddingsite



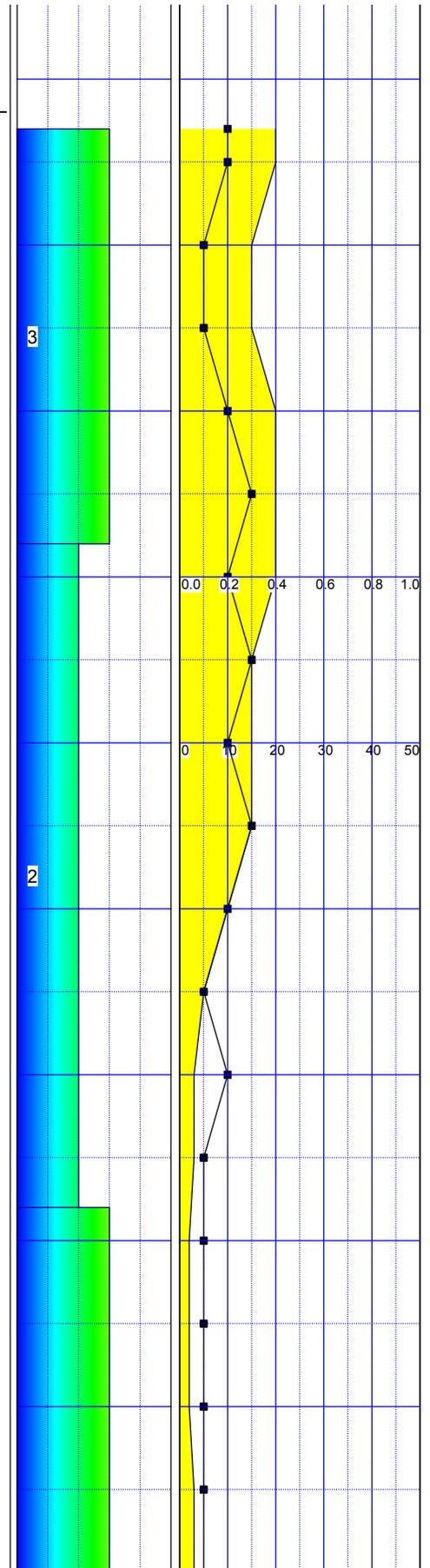


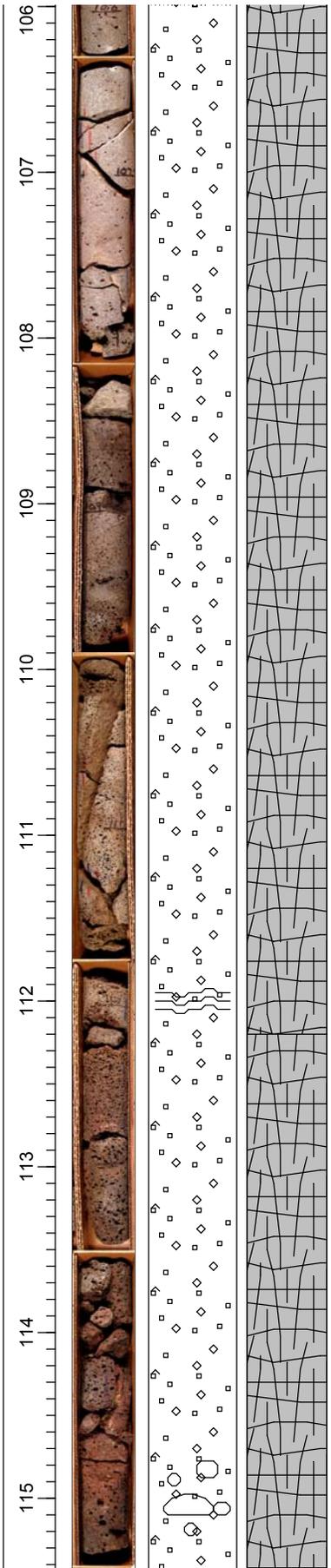
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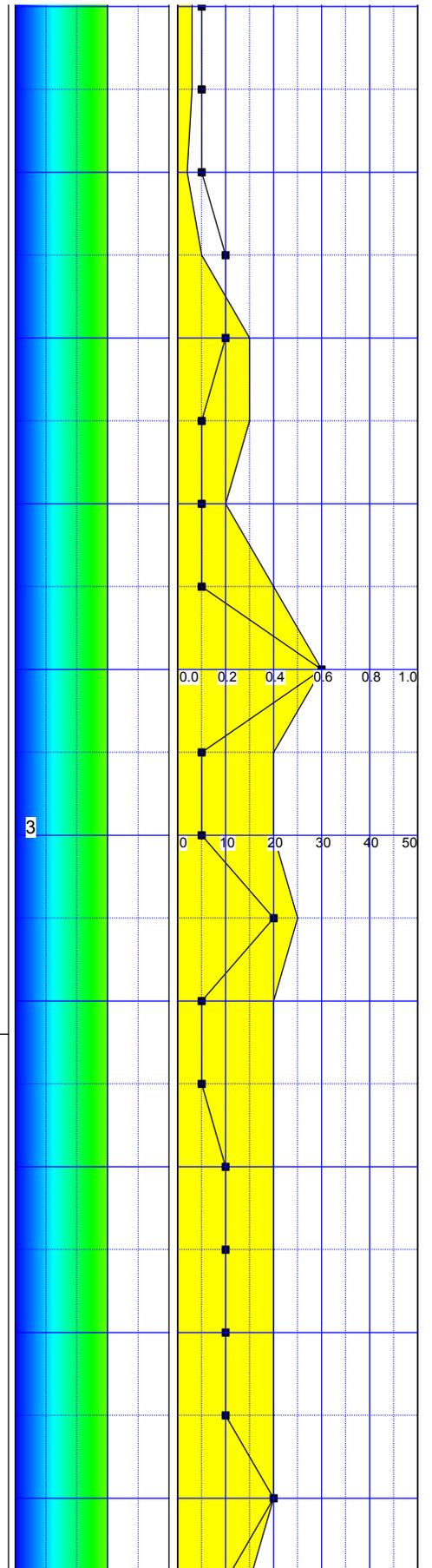


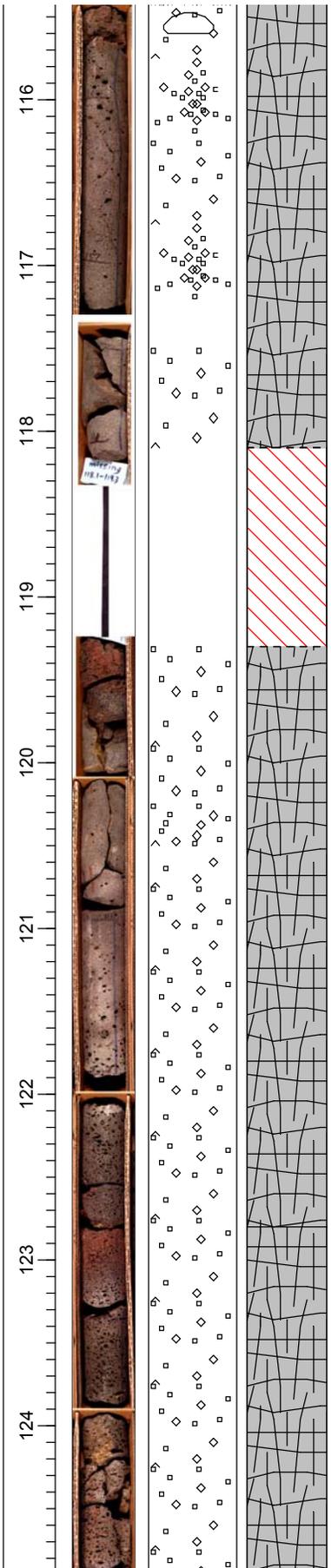
BASALT:  
 COLOR: N4 Medium Dark Gray  
 TEXTURE: Phaneritic, vesicular basalt;  
 vesicular throughout, vesicle planes at  
 103.5 feet and 105.6 feet, vesicle cylinders  
 at 105.8 feet, megavesicle at 102.3 feet,  
 large vesicles at 100.5 feet and 101.5 feet  
 COMPOSITION: 35% plagioclase, 25% olivine,  
 40% groundmass; submillimeter to rare 1 mm  
 tabular plagioclase laths, anhedral to  
 euhedral submillimeter to rare 2 mm olivine  
 phenocrysts, microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: N3 Dark Gray  
 basalt at 102.3 feet, 25% tabular to fibrous  
 plagioclase laths, less than 5% olivine  
 submillimeter microcrysts, 70% groundmass  
 ALTERATION: 10YR 8/2 Very Pale Orange  
 calcitic mud in vesicles in upper section of  
 interval, slight alteration of olivine to  
 iddingsite, flow and mold structure at base





**BASALT:**  
 COLOR: N3 Dark Gray on fresh surfaces with areas of 5RP 4/2 Grayish Red Purple  
 TEXTURE: Mostly aphanitic, vesicular basalt; vesicular throughout though decreasingly vesicular at the base, vesicle planes at 116.0 feet to 117.0 feet, vesicle cylinders at 116.0 feet to 117.0 feet, megavesicles at 115.0 feet and 115.5 feet, large vesicles at 115.0 feet  
 COMPOSITION: 30% plagioclase, 15% olivine, 55% groundmass; submillimeter to rare 1 mm tabular plagioclase laths, anhedral to subhedral submillimeter to 1 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange mud in vesicles and fractures in upper section of interval, slight to moderate alteration of olivine to iddingsite

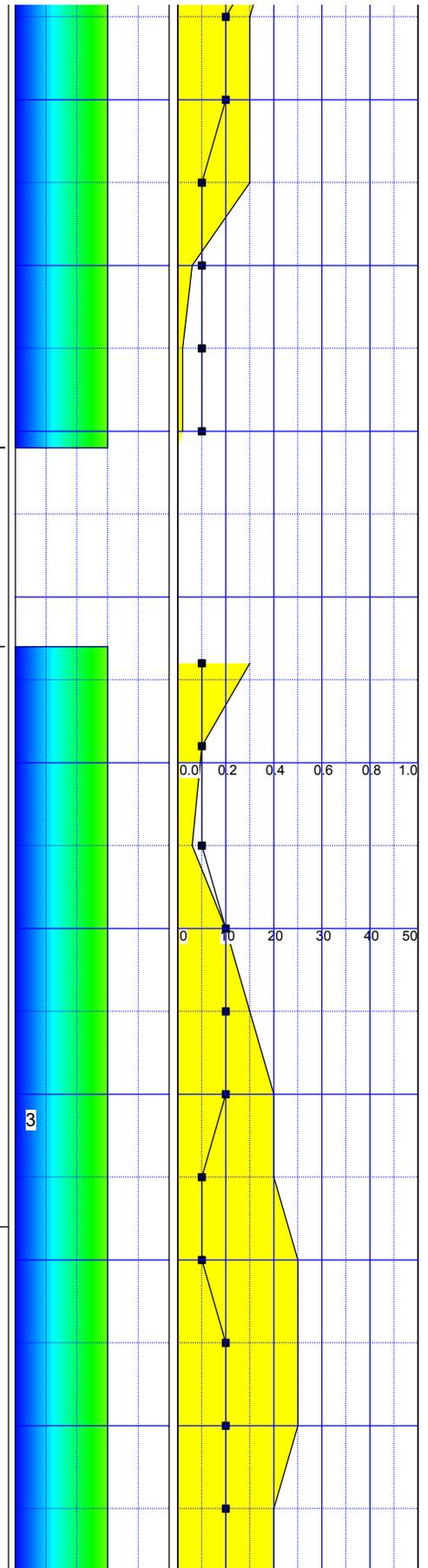


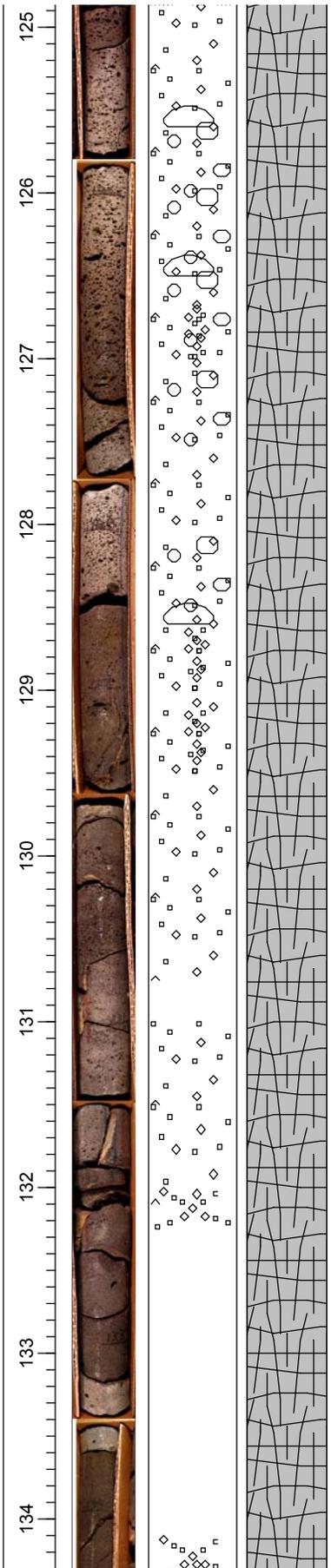


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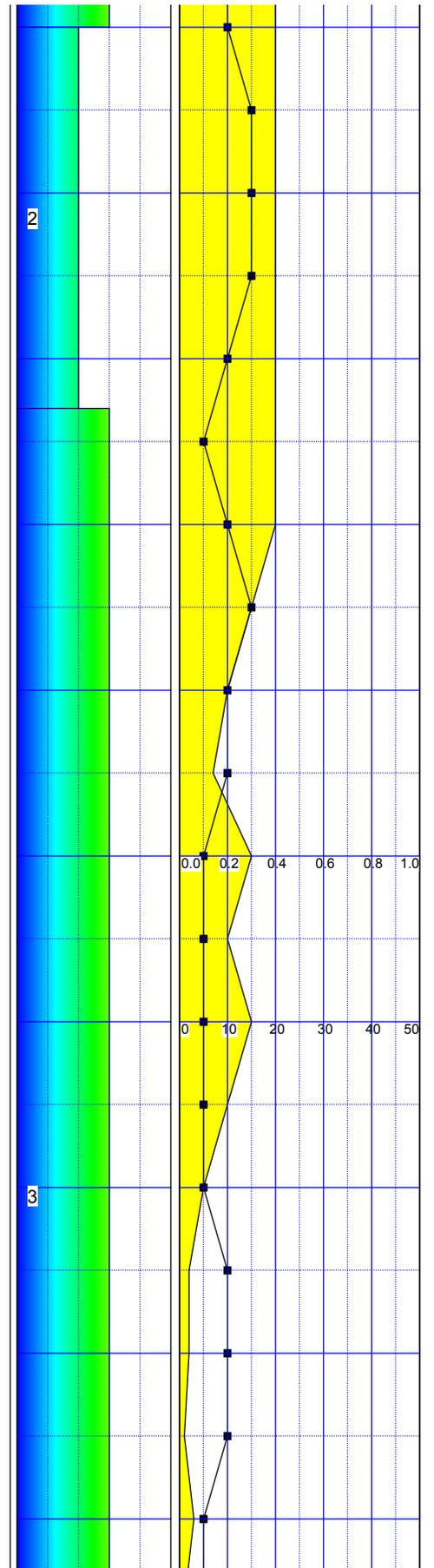
BASALT:  
 COLOR: 5 YR 4/1 Brownish Gray to N4 Medium Dark Gray  
 TEXTURE: Mostly aphanitic, vesicular basalt; vesicular throughout, scoriaceous near the top  
 COMPOSITION: 30% plagioclase, 25% olivine, 45% groundmass; submillimeter to rare 1 mm tabular plagioclase laths, anhedral to subhedral submillimeter to 1 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange mud in vesicles and fractures, slight alteration of olivine to iddingsite, flow and mold structure at base

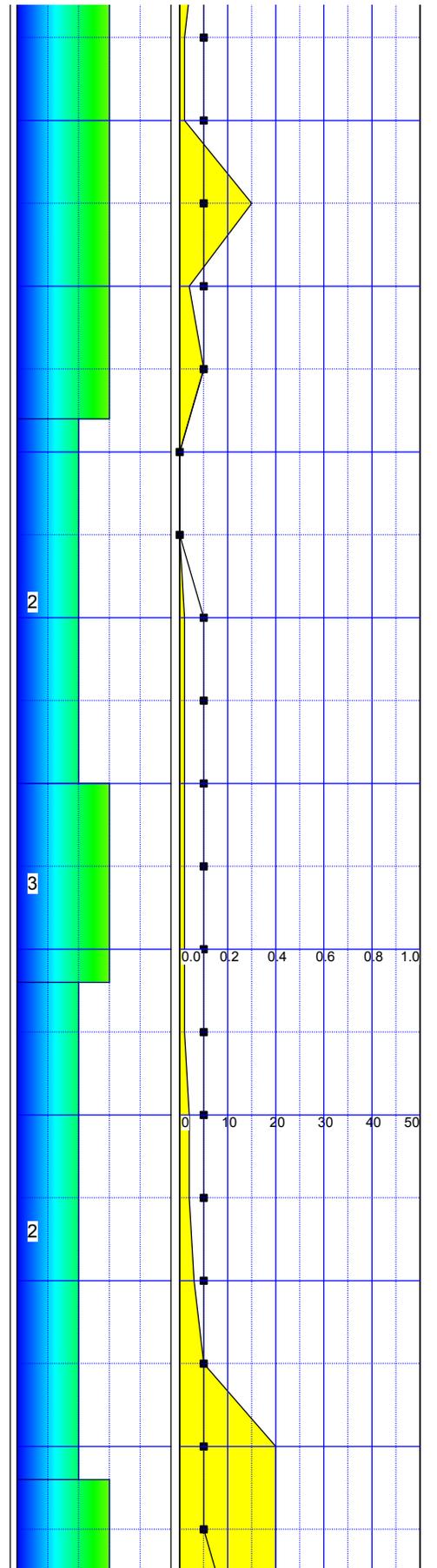
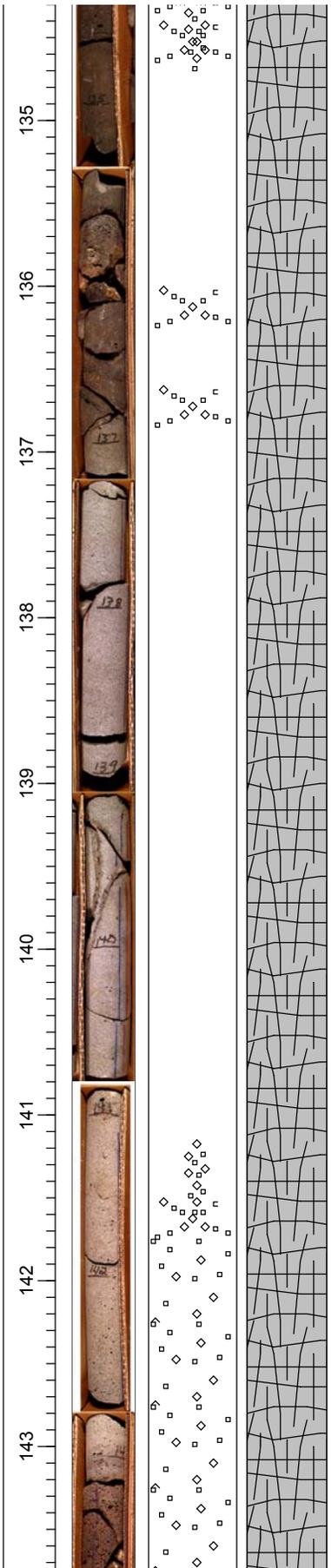
BASALT:  
 COLOR: 5 YR 4/1 Brownish Gray to N4 Medium Dark Gray  
 TEXTURE: Mostly aphanitic, vesicular, diktytaxitic basalt; vesicular from 122.8 feet to 132.1 feet and from 141.4 feet to 148.0 feet, diktytaxitic from 132.1 feet to 141.4 feet, some large vesicles and megavesicles from 125.1 feet to 128.5 feet, vesicle columns common, vesicle planes common in diktytaxitic region and lower vesicular region, large vesicles at 147.6 feet  
 COMPOSITION: 35% plagioclase, 20% olivine, 45% groundmass; submillimeter to rare 1 mm tabular plagioclase laths, anhedral to subhedral submillimeter to 1 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted

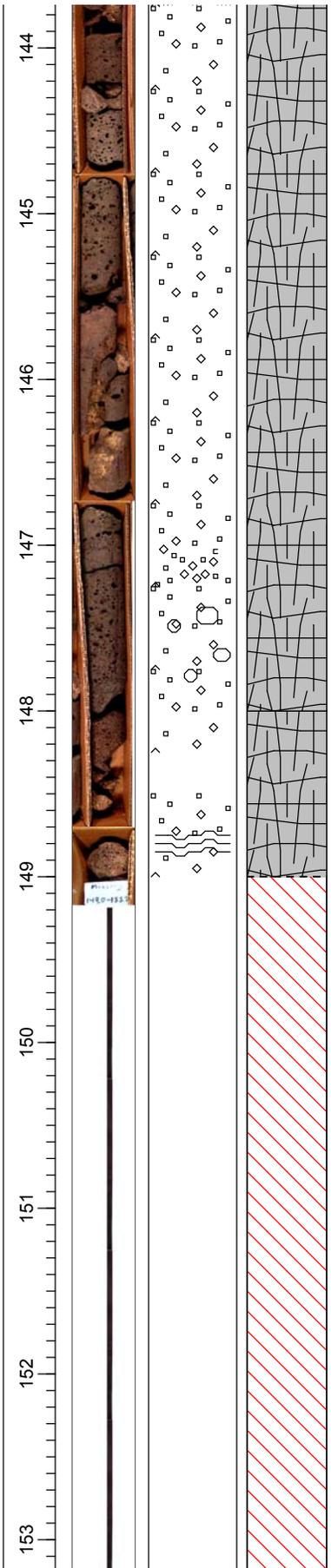




ALTERATION: Rare 10YR 8/2 Very Pale Orange mud in vesicles and fractures, slight alteration of olivine to iddingsite, flow and mold structure at base

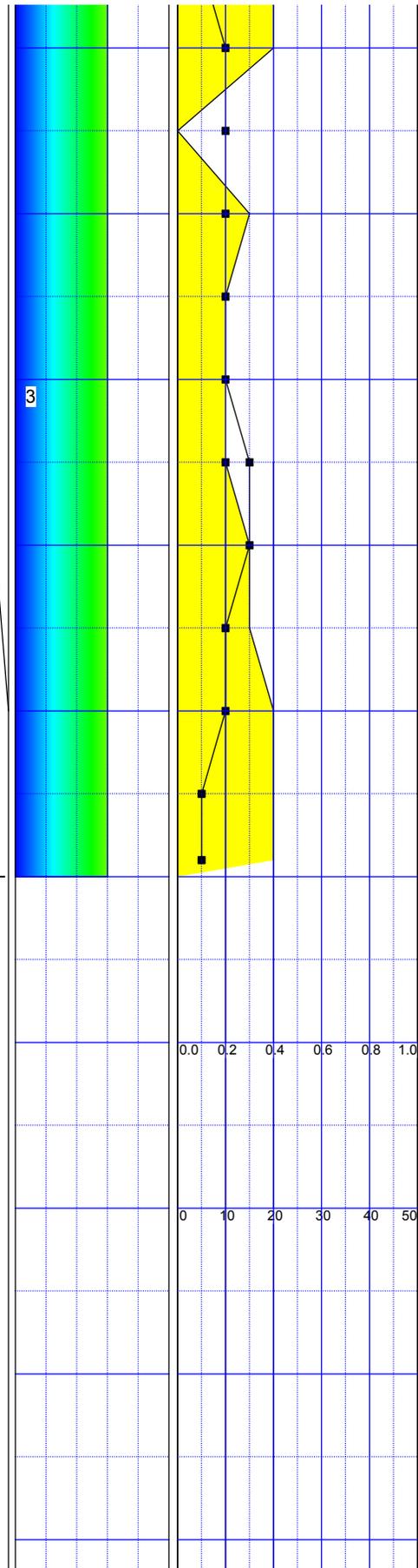


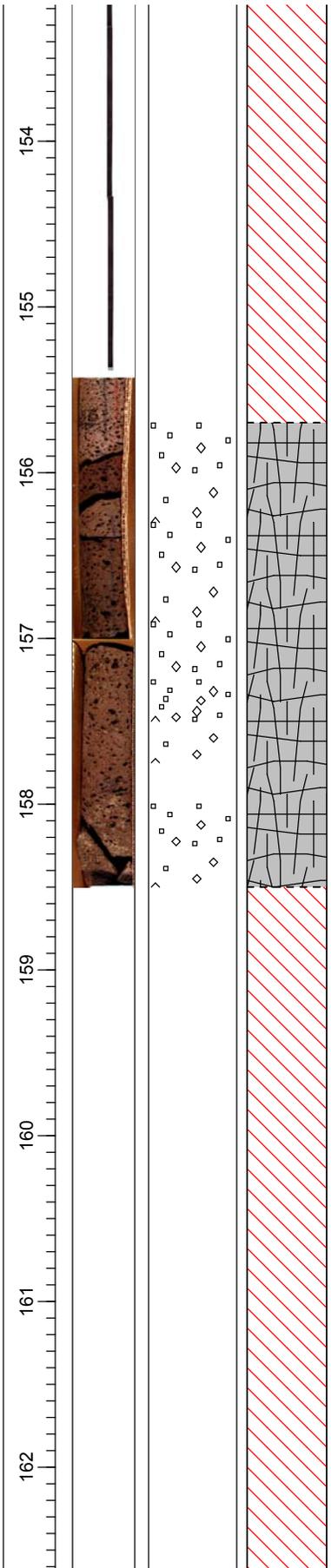




**BASALT:**  
 COLOR: 10R 4/2 Grayish Red  
 TEXTURE: Aphanitic, vesicular basalt;  
 vesicular throughout  
 COMPOSITION: 25% plagioclase, 30% olivine,  
 45% groundmass; submillimeter to rare 1 mm  
 tabular plagioclase laths, anhedral to  
 subhedral submillimeter to 1 mm olivine  
 microcrysts and glomerocrysts, rare  
 pyroxene, red groundmass  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange  
 mud in vesicles and on fractured surfaces,  
 high amount of alteration of olivine to  
 iddingsite

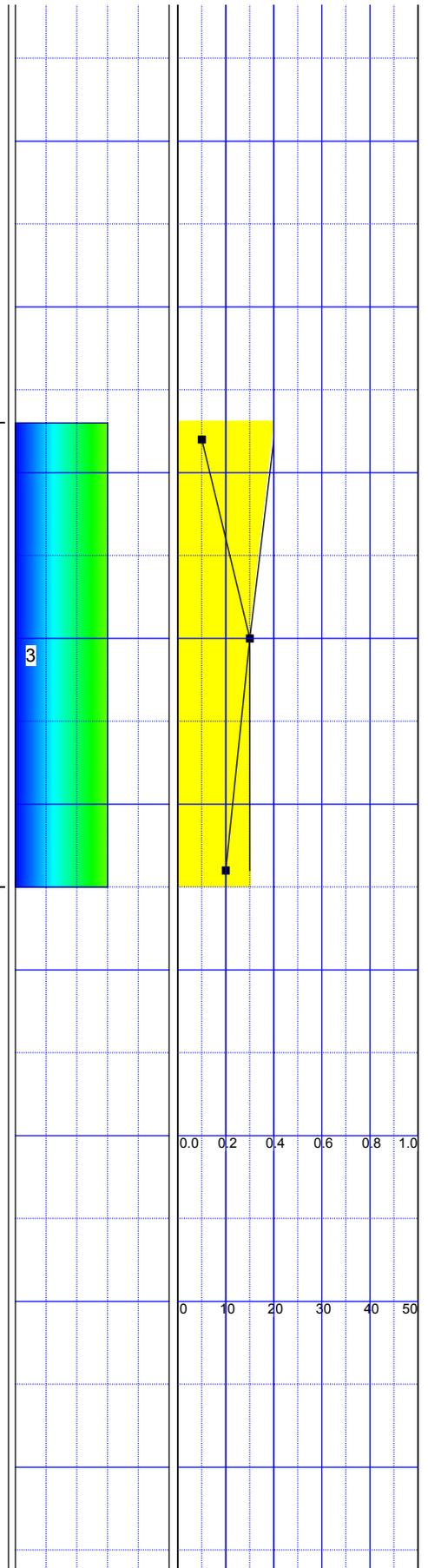
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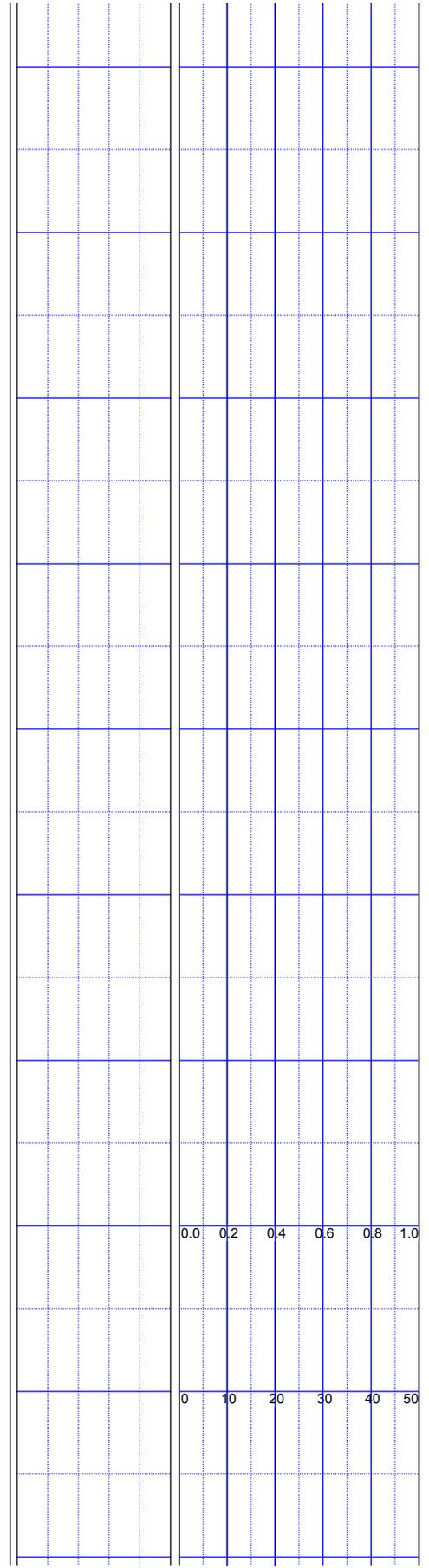
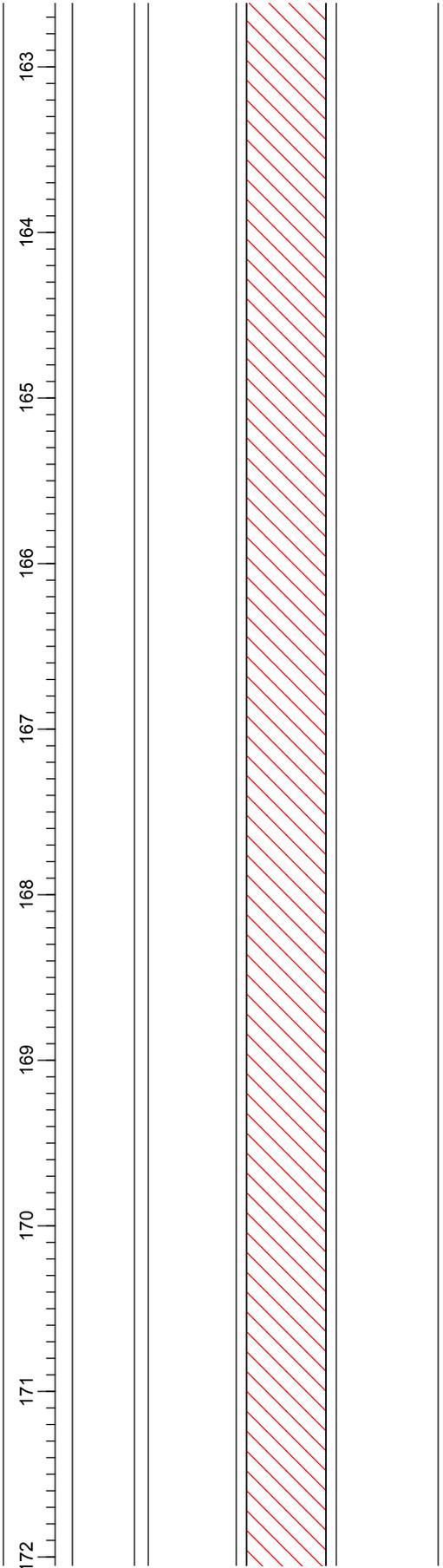


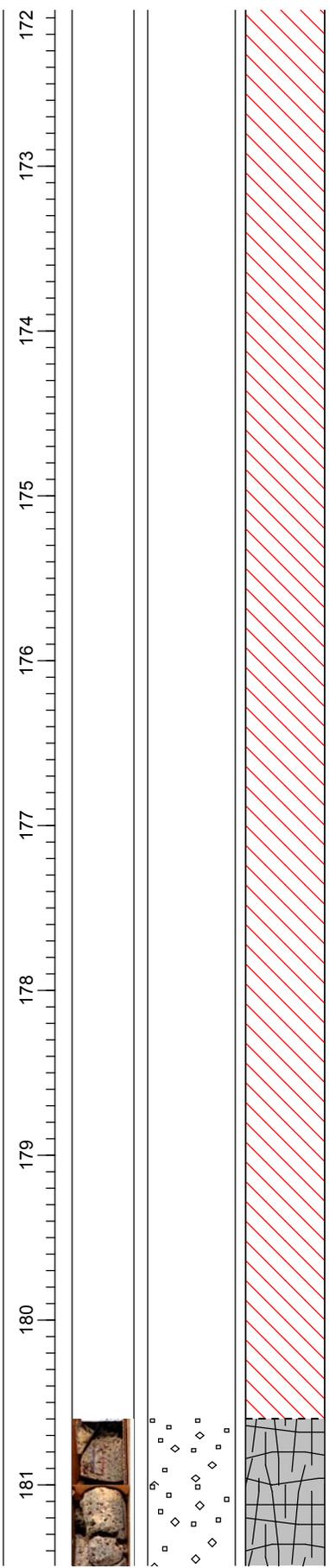


BASALT:  
 COLOR: 10R 4/2 Grayish Red  
 TEXTURE: Aphanitic, vesicular basalt;  
 vesicular throughout  
 COMPOSITION: 25% plagioclase, 30% olivine,  
 45% groundmass; submillimeter to rare 1 mm  
 tabular plagioclase laths, anhedral to  
 subhedral submillimeter to 1 mm olivine  
 microcrysts and glomerocrysts, rare  
 pyroxene, red groundmass  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange  
 mud in vesicles and on fractured surfaces,  
 extensive alteration of olivine to  
 iddingsite

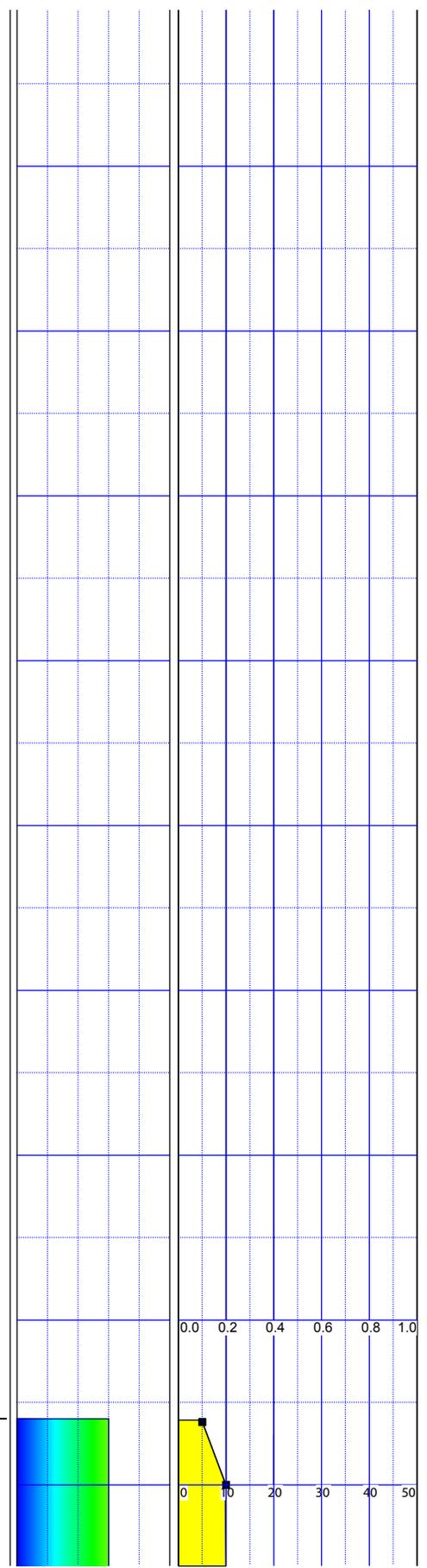
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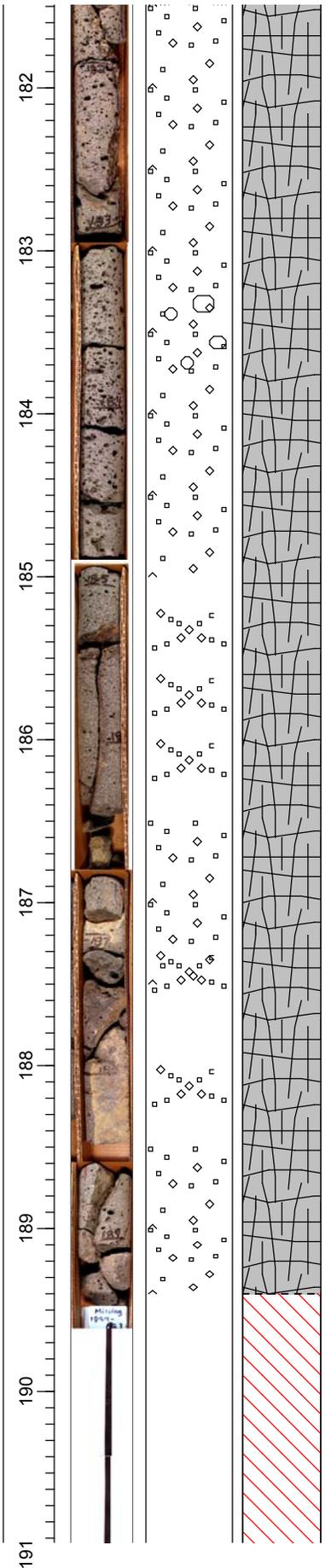






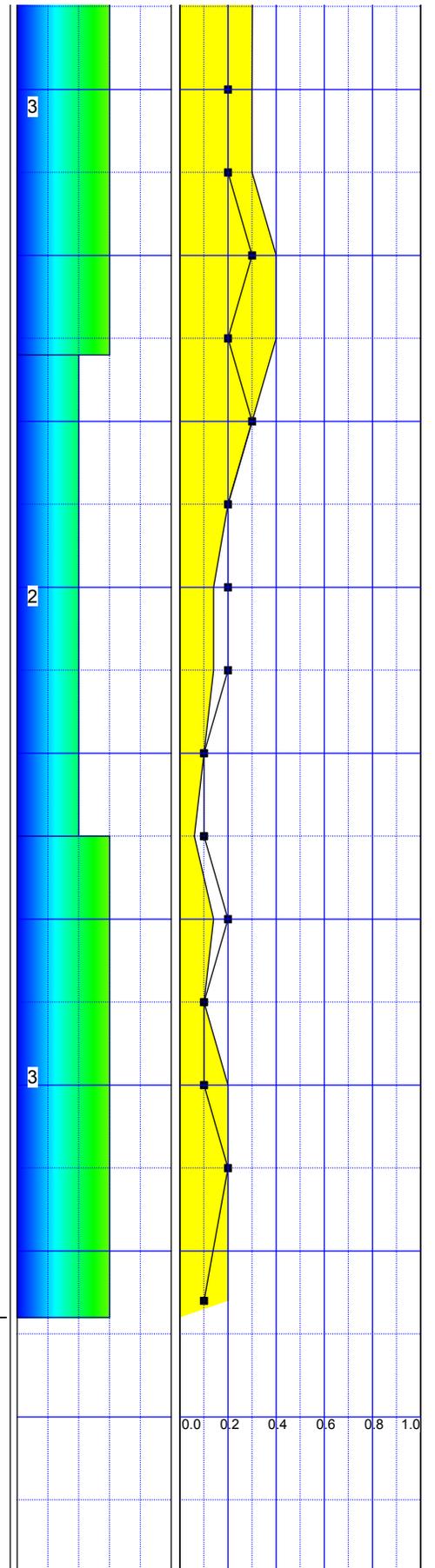
BASALT:  
 COLOR: N4 Medium Dark Gray  
 TEXTURE: Mostly aphanitic, vesicular basalt;  
 vesicular throughout, vesicle planes common  
 from 184.5 feet to 186.3 feet, large  
 vesicles at 183.5 feet  
 COMPOSITION: 25% plagioclase, 20% olivine,  
 55% groundmass; submillimeter to rare 1 mm

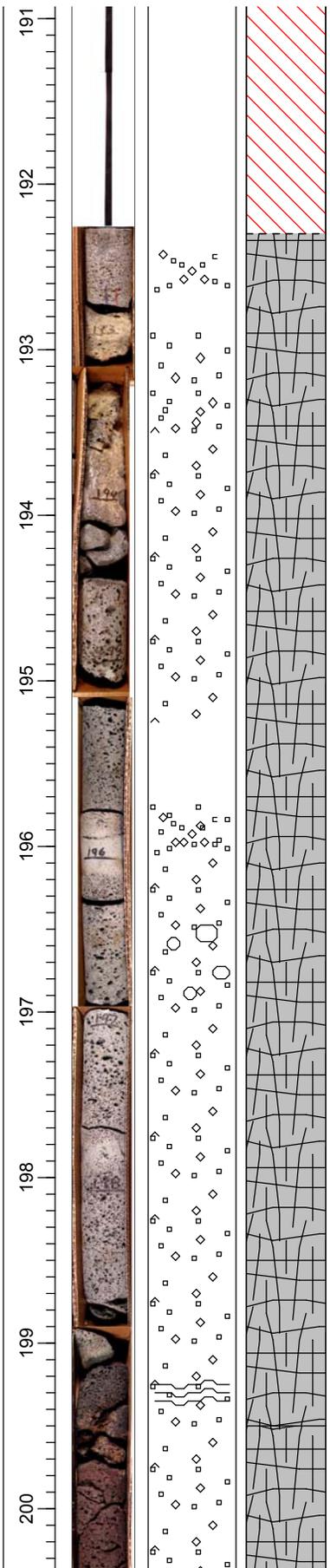




tabular plagioclase laths, anhedral to subhedral submillimeter to 1 mm olivine microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Rare 10YR 8/2 Very Pale Orange mud in vesicles and on fractured surfaces, very slight amount of alteration of olivine to iddingsite

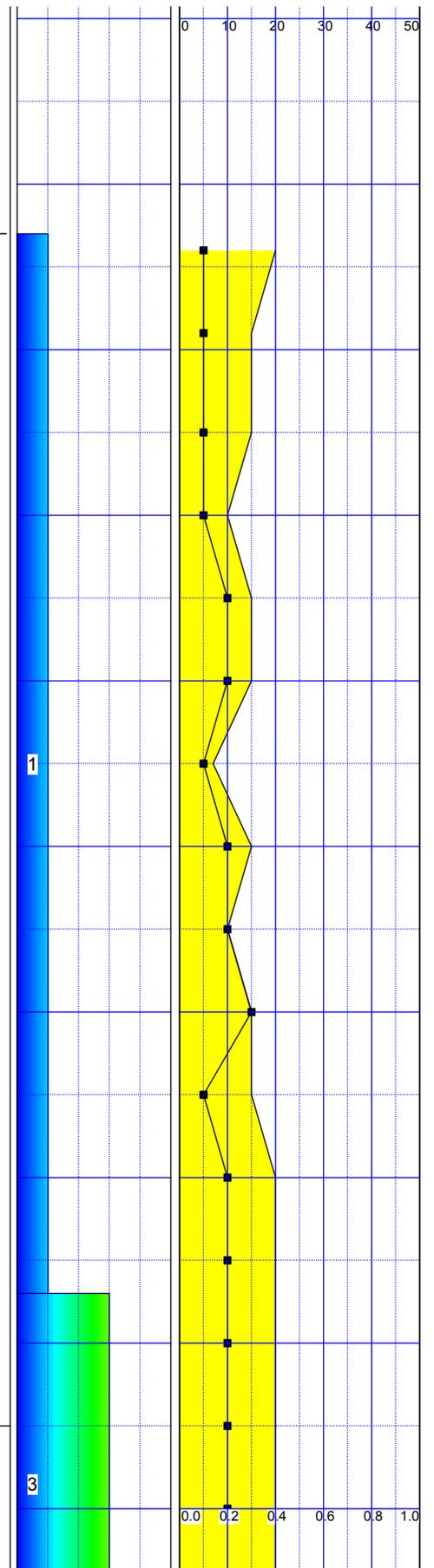
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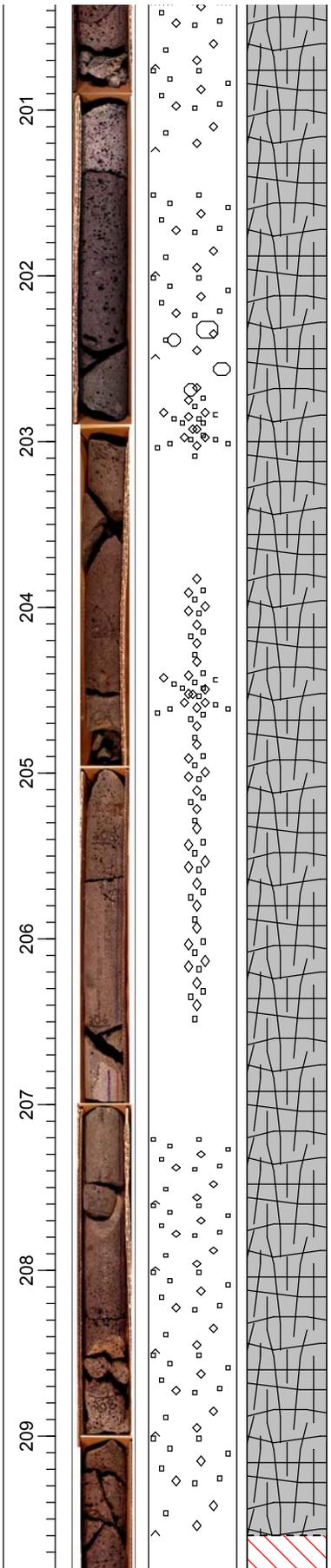




BASALT:  
 COLOR: N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular basalt, vesicular throughout, vesicle planes numerous from 192.3 feet to 192.9 feet and located at 195.9 feet and 198.4 feet, large vesicles at 196.7 feet, rubbly at the base  
 COMPOSITION: 50% plagioclase, 25% olivine, 25% groundmass; mostly submillimeter plagioclase laths, submillimeter to 1 mm anhedral to subhedral olivine microcrysts and some glomerocrysts, very rare pyroxene  
 XENOLITHS/AUTOLITHS: possible xenolith at 192.9 feet  
 ALTERATION: 10 YR 8/2 Very Pale Orange calcitic mud in some vesicles and on fractured surfaces at top of interval, very slight alteration of olivine to iddingsite, flow and mold structure at the base

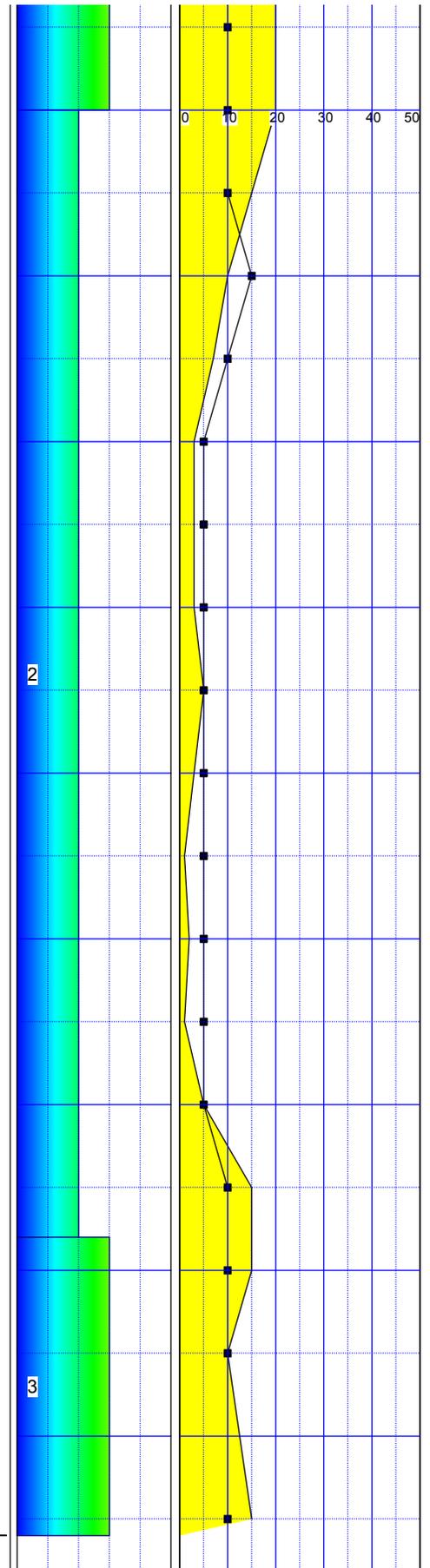
BASALT:  
 COLOR: 5R 4/2 Grayish Red grading to N4 Medium Dark Gray  
 TEXTURE: Aphanitic, vesicular, diktytaxitic basalt; vesicular from 199.5 feet to 203.2 feet and from 207.2 feet to 209.6 feet, diktytaxitic from 203.2 feet to 207.2 feet, vesicle columns/planes from 202.8 feet 204.5

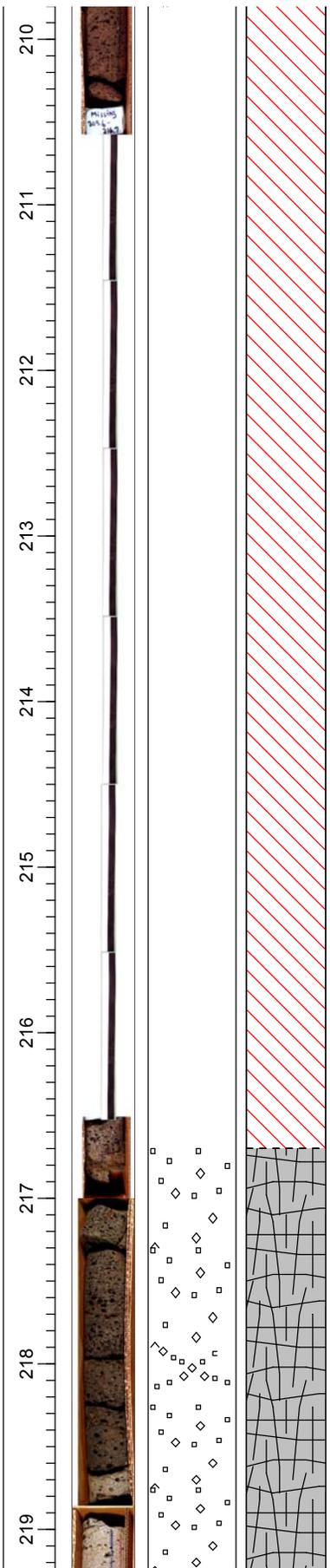




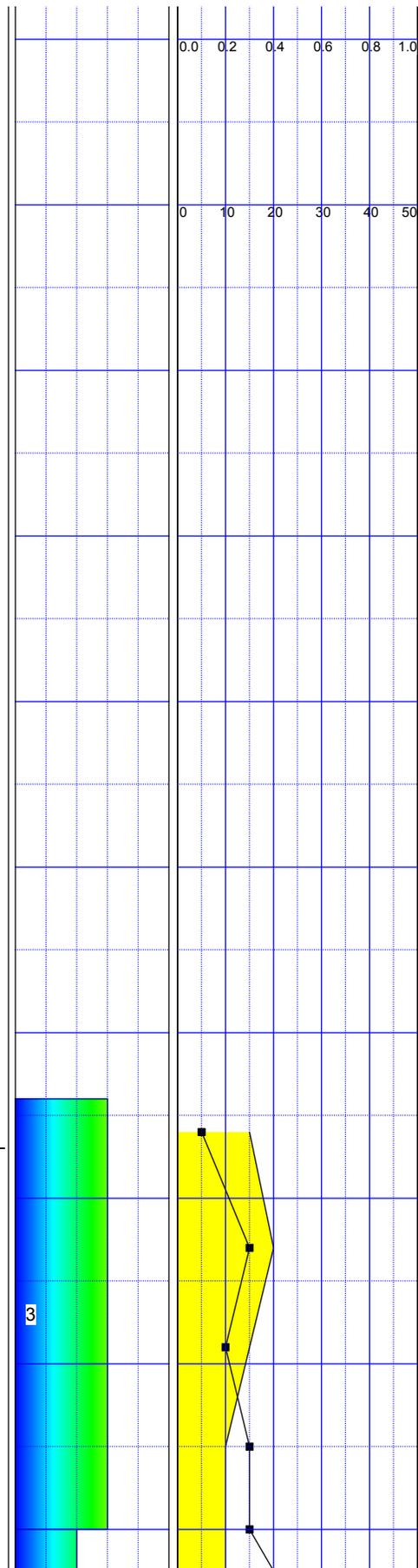
feet, vesicle cylinder from 204.8 feet to 206.5 feet, some large vesicles at 202.5 feet.  
 COMPOSITION: 35% plagioclase, 15% olivine, 50% groundmass; submillimeter tabular, lathy plagioclase, anhedral to subhedral submillimeter olivine microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 Very Pale Orange mud calcitic mud on fractured surfaces and in vesicles near fractured surfaces, slight alteration of olivine to iddingsite

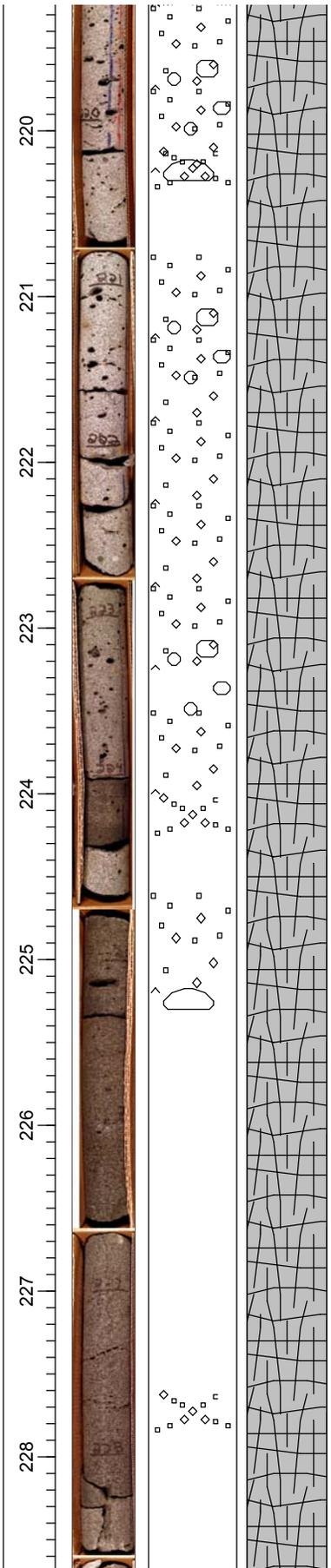
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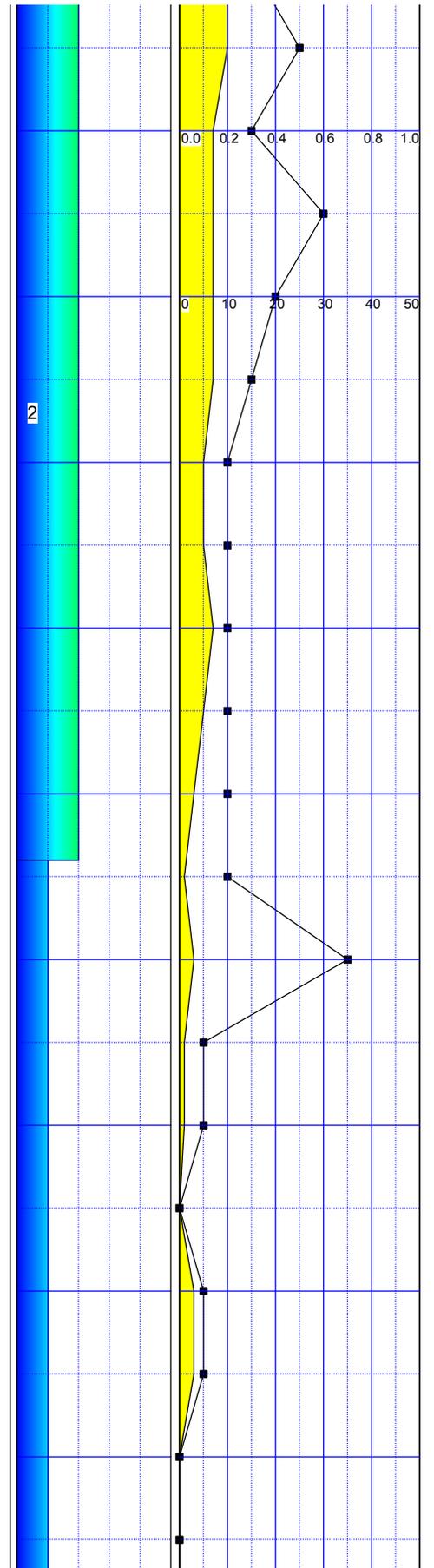


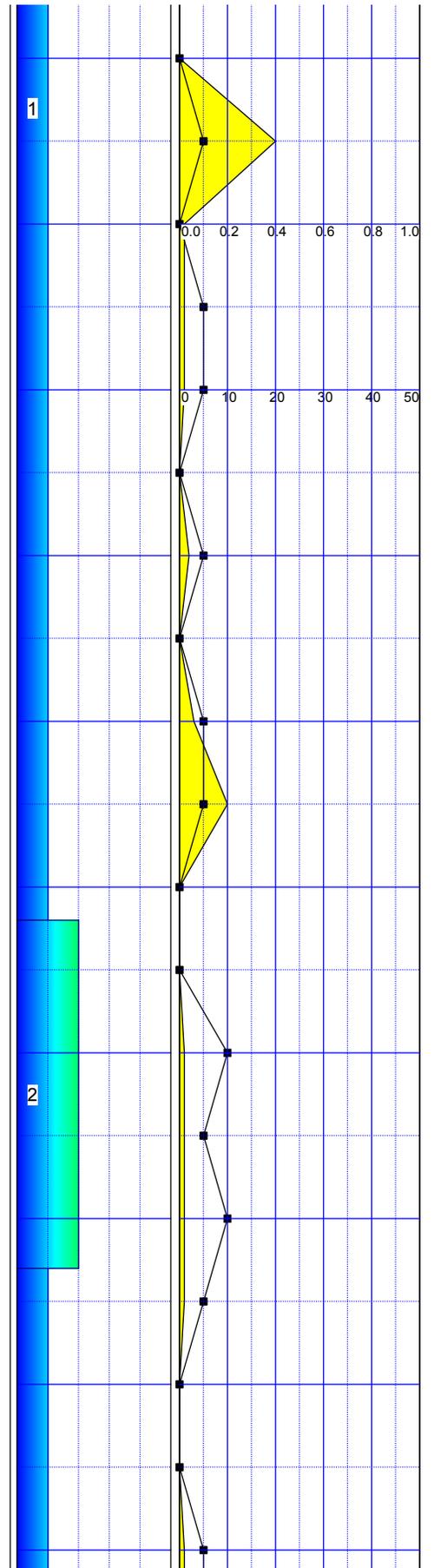
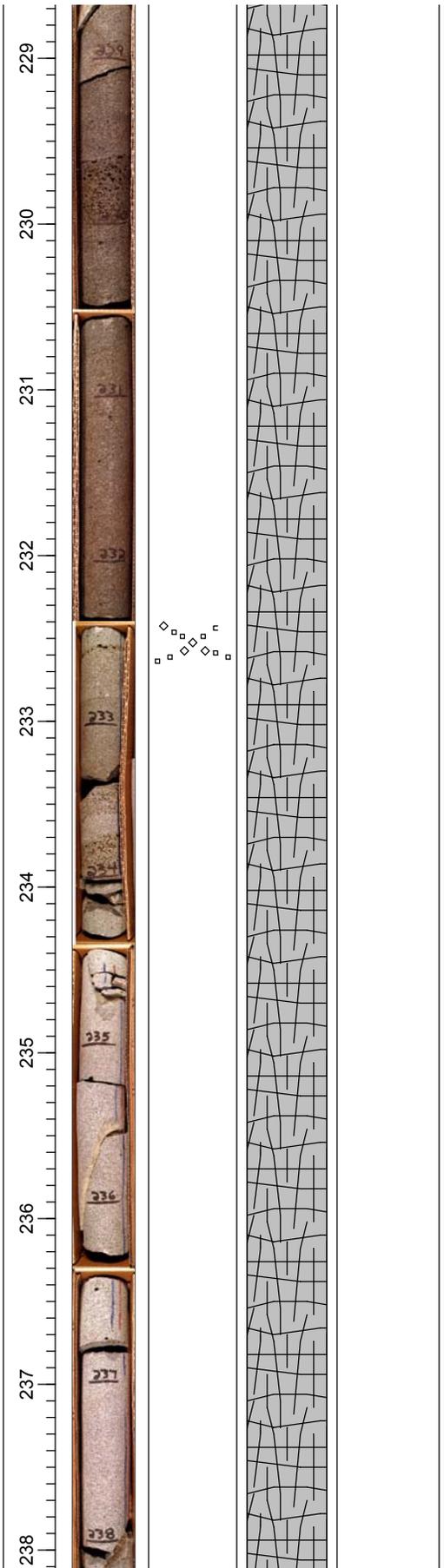
BASALT:  
 COLOR: N5 Medium Gray  
 TEXTURE: Medium grained phaneritic, vesicular, diktytaxitic basalt; vesicular from 216.7 feet to 225.2 feet and from 244.2 feet to 247.9 feet, diktytaxitic texture can be seen throughout entire section of interval, vesicle planes occur at 220.2 feet, 224.1 feet, 227.4 feet, 227.7 feet and 232.5 feet, rare megavesicle(s) at 225.2 feet, large vesicles at 219.8 feet, 221.3 feet and 223.3 feet, rubbly at base  
 COMPOSITION: 50% plagioclase, 30% olivine, 1% pyroxene, 19% groundmass; submillimeter to 3 mm tabular lath-shaped plagioclase phenocrysts at the top of the interval increasing up to 5mm plagioclase phenocrysts near the base of the interval, subhedral to euhedral submillimeter to 2 mm olivine microcrysts, phenocrysts and glomerocrysts, rare anhedral to subhedral pyroxene  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 Very Pale Orange

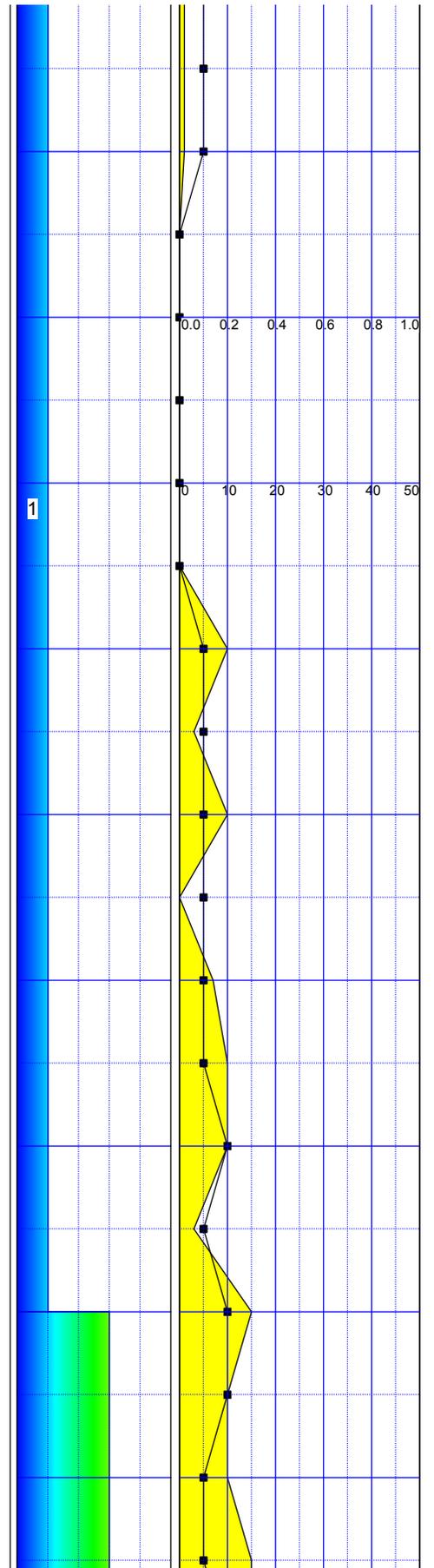
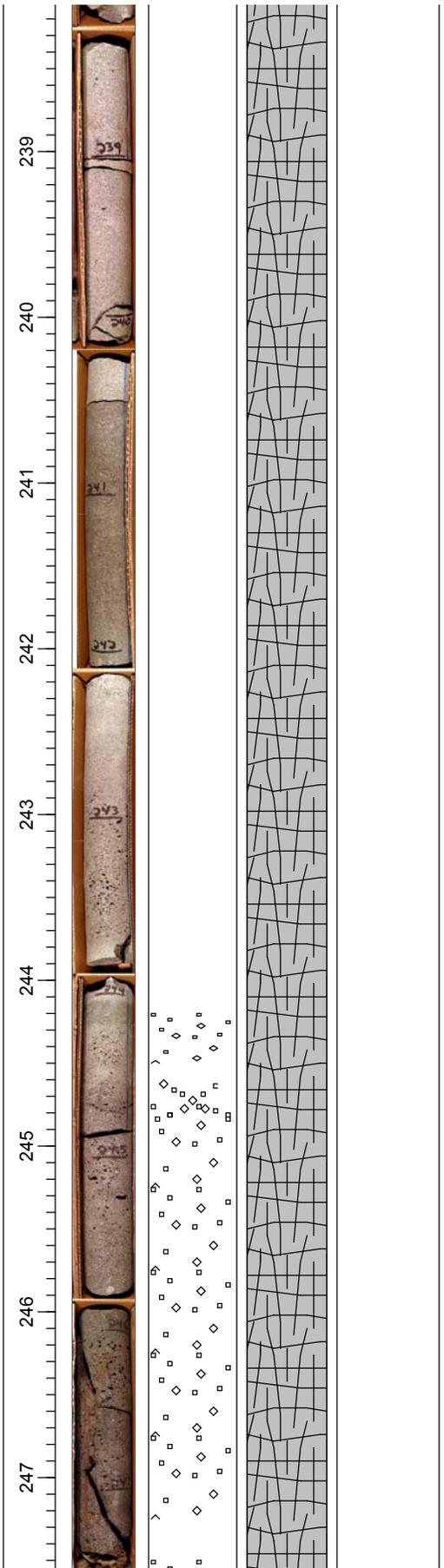


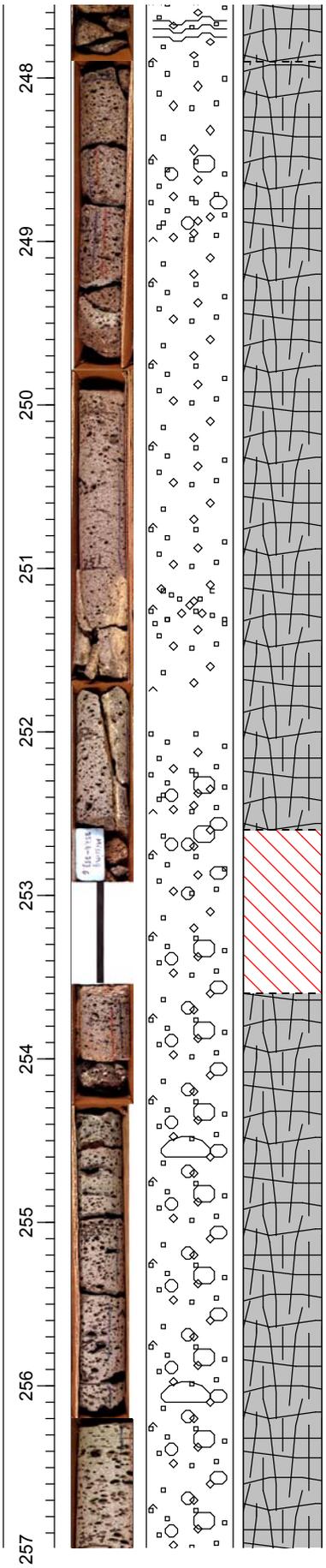


calcitic mud on fractured surfaces and in vesicles near fractures, calcite deposits in some vesicles near fractured surfaces, slight alteration of olivine to iddingsite, flow and mold structure at the base





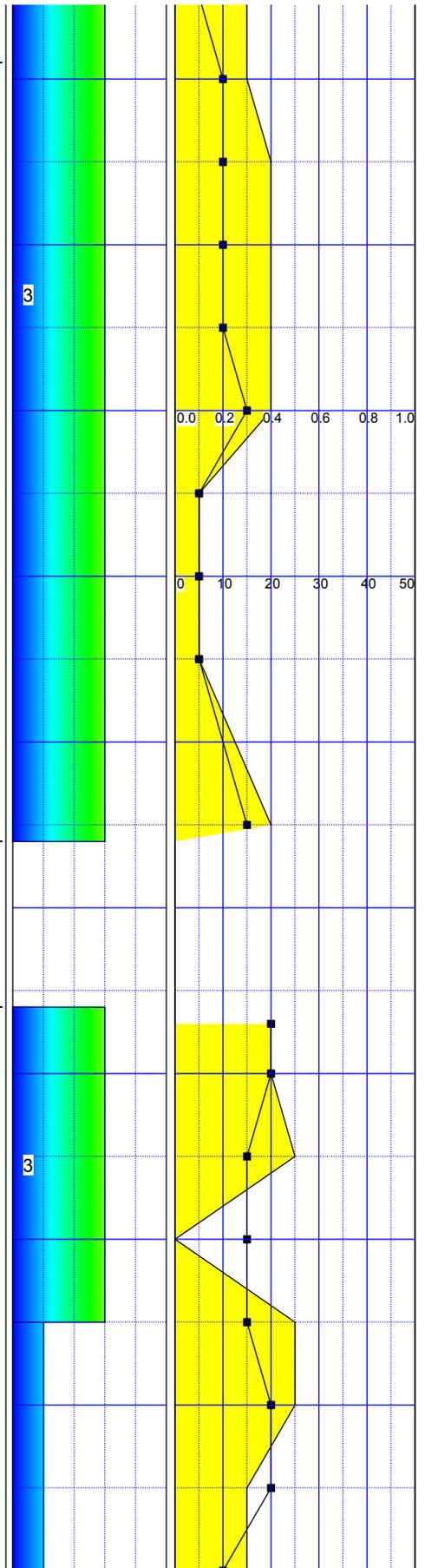


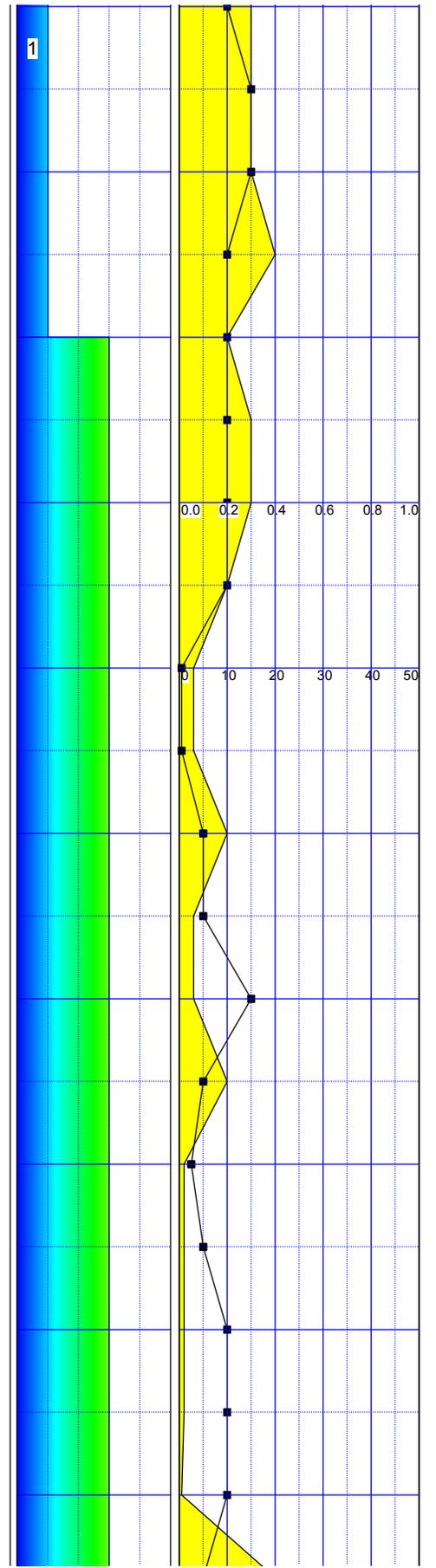
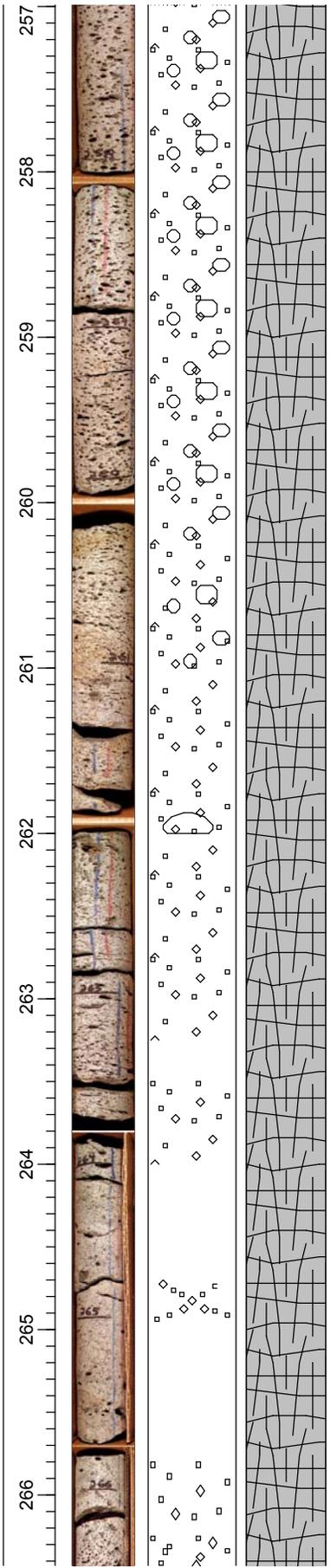


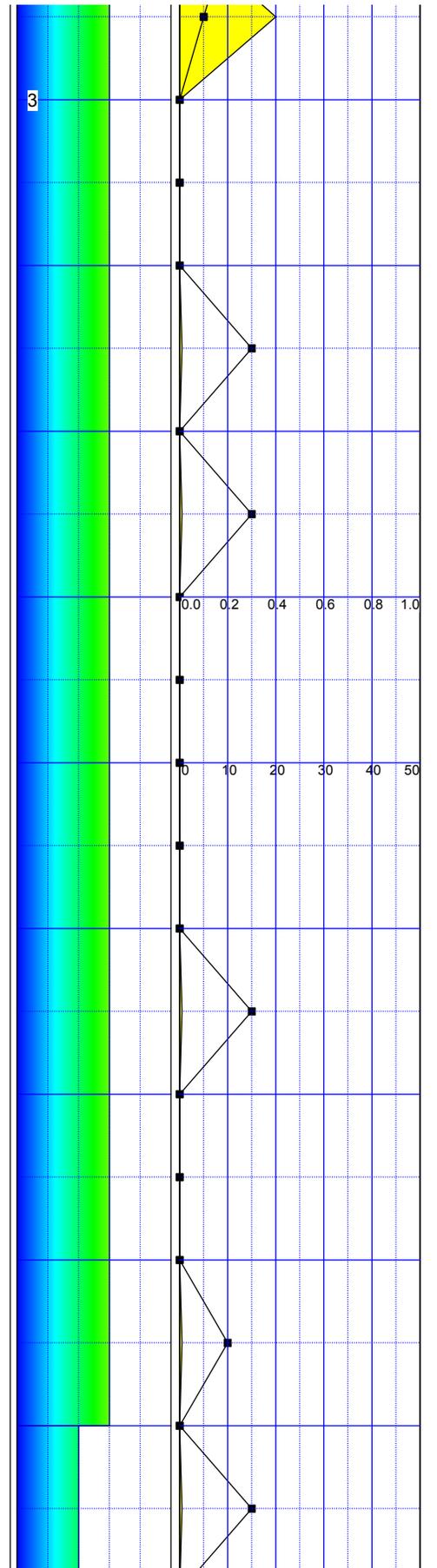
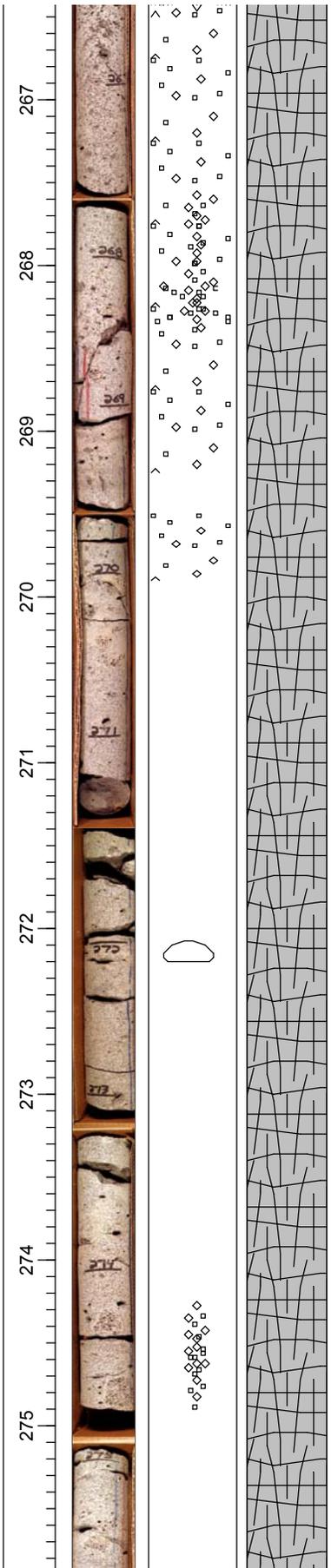
**BASALT:**  
 COLOR: 5R 4/2 Grayish Red grading to N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicles common throughout, large vesicles at 248.7, 252.5, and 252.8 feet  
 COMPOSITION: 40% plagioclase, 25% olivine, 3% pyroxene, 42% groundmass; mostly submillimeter plagioclase laths with rare submillimeter to 3 millimeter tabular plagioclase lathes, submillimeter anhedral to subhedral olivine microcrysts, some anhedral to subhedral pyroxene  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 Very pale Orange calcitic mud in fracture zone, rare calcitic mud in vesicles near fracture, heavy alteration of olivine to iddingsite near top, decreasing near base

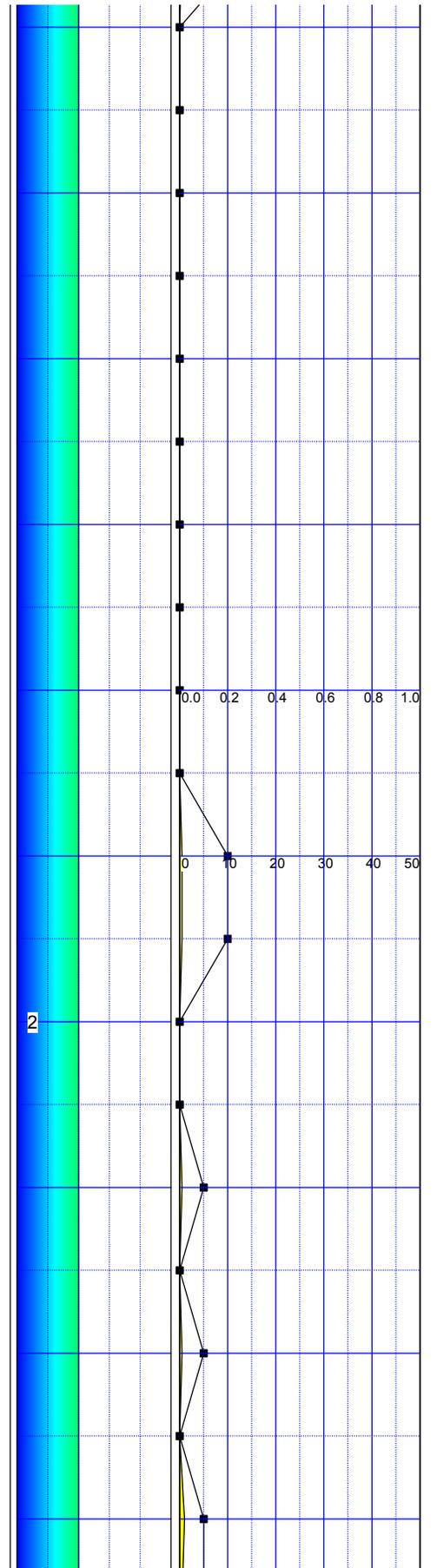
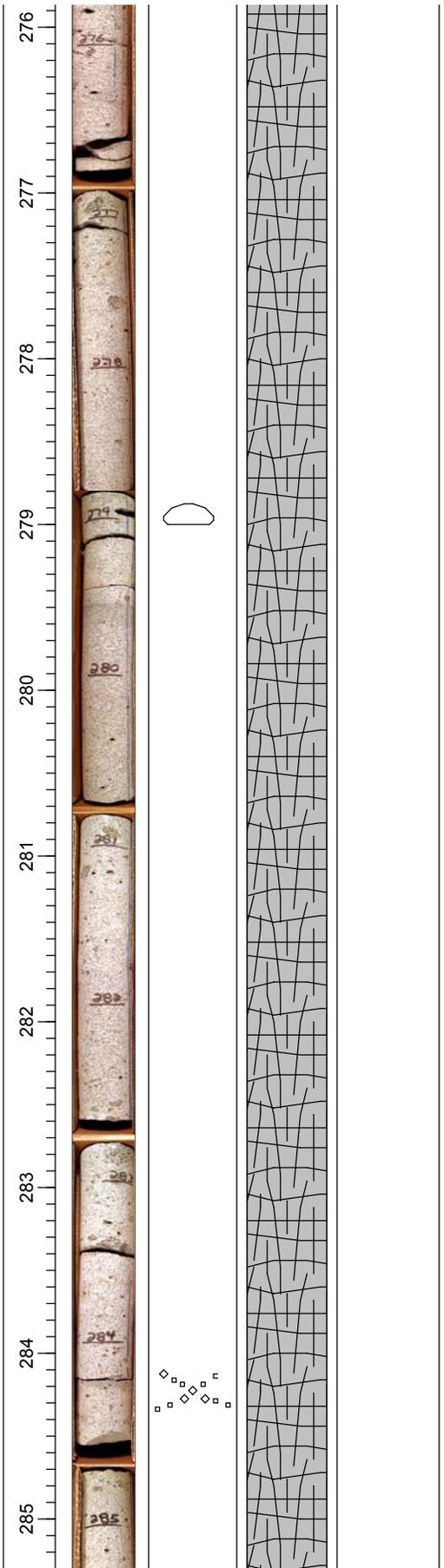
**MISSING INTERVAL:**  
 Missing interval not recovered

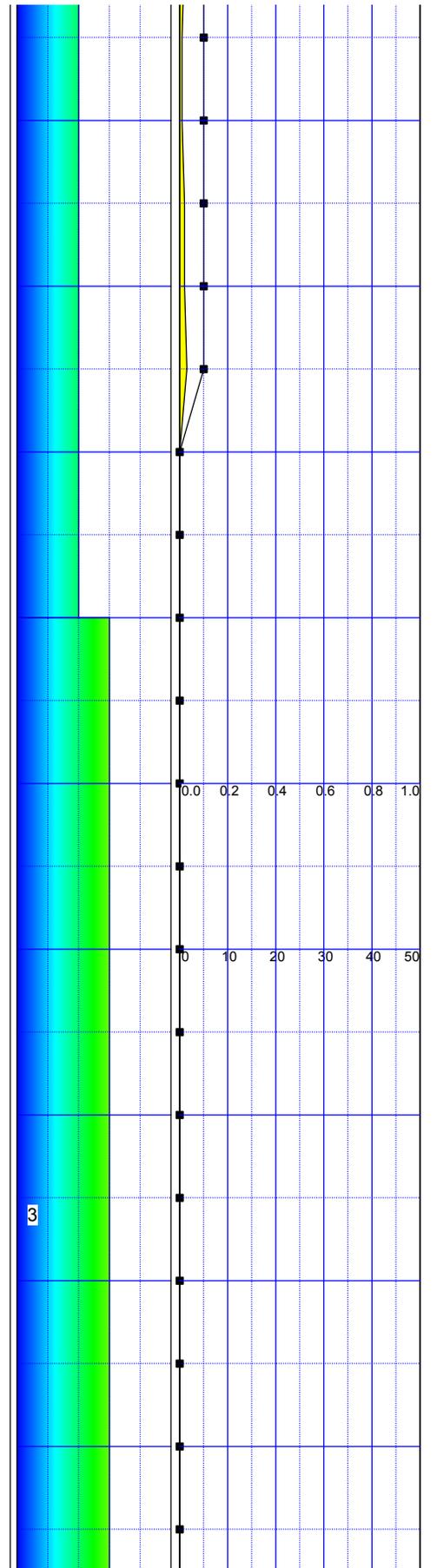
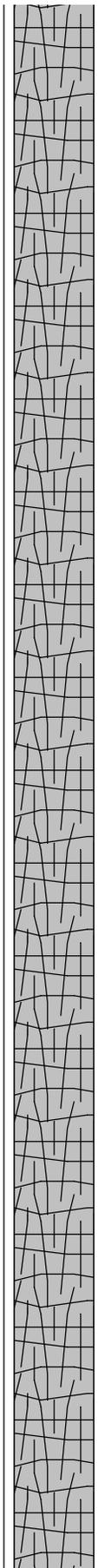
**BASALT:**  
 COLOR: N3 Dark Gray grading to N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular to massive, vesicular zone from 253.5 feet to 260.8 feet, vesicular from 260.8 feet to 264.0 feet, massive from 264.0 feet to 265.8 feet, vesicular from 265.8 feet to 269.9 feet, massive from 269.9 feet, to 329.0 feet large vesicles common in vesicular zone, megavesicles at 254.5 feet, 256.0 feet, 261.9 feet, 262.8 feet, 272.1 feet, 278.9 feet, and 313.2 feet, vesicle planes at 251.2 feet, 264.8 feet, 268.2 feet, 284.2 feet, and 302.3 feet  
 COMPOSITION: 30% olivine, 20% pyroxene 15% plagioclase, 35% groundmass; submillimeter to 1 centimeter subhedral olivine, submillimeter to millimeter anhedral to subhedral pyroxene, submillimeter to millimeter plagioclase laths  
 XENOLITHS/AUTOLITHS: Autoliths from 267.5 to 327.5 feet, size increases and frequency decreases with increasing depth, sizes range from 0.5 inches to 3 x 6.0 inches  
 ALTERATION: 10YR Very Pale Orange calcite mud in fracture zones near top, 10YR 7/4 Grayish Orange calcareous mud in fractures and vesicles; all olivine microcrysts have iddingsite alteration

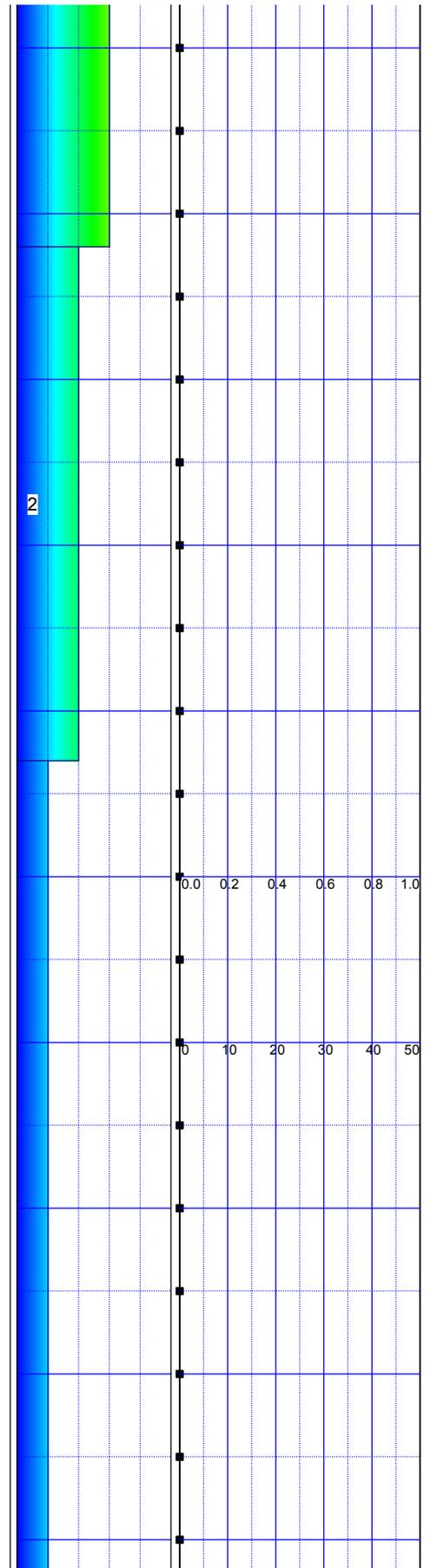
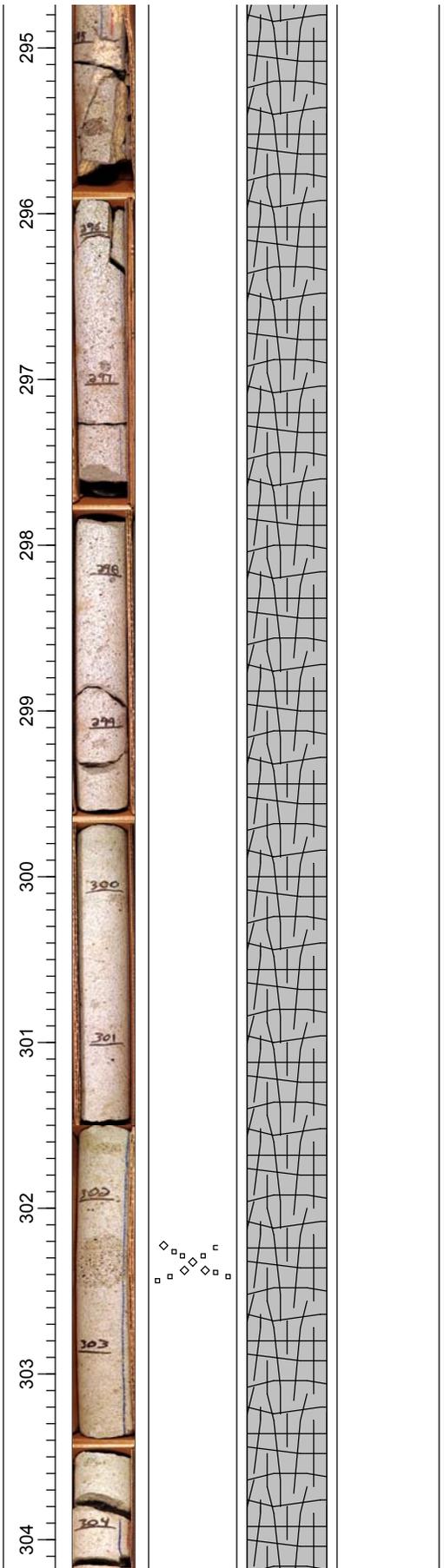


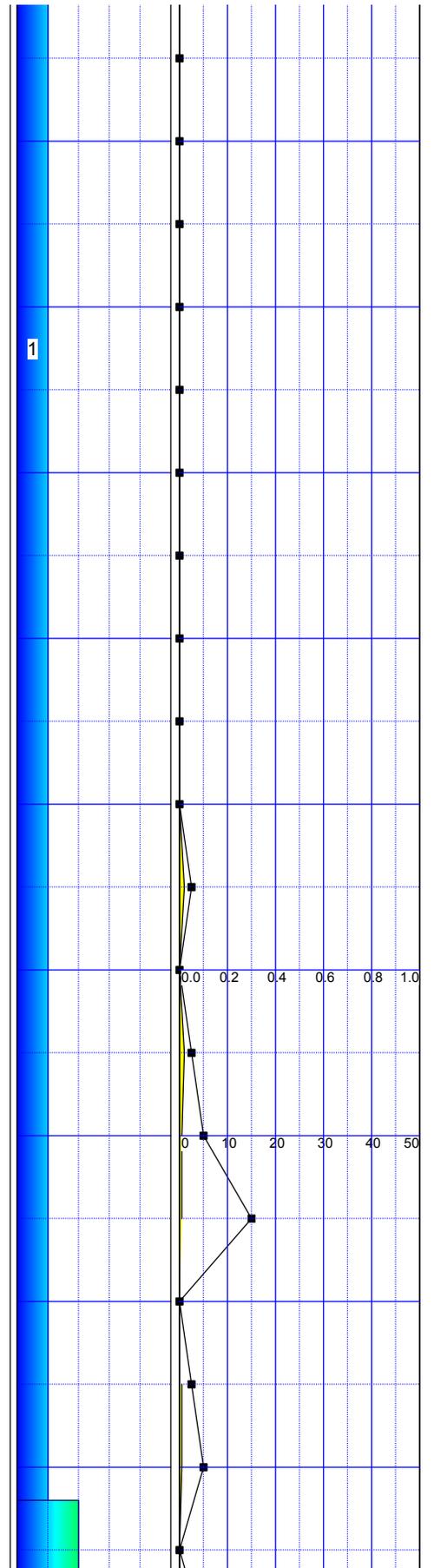
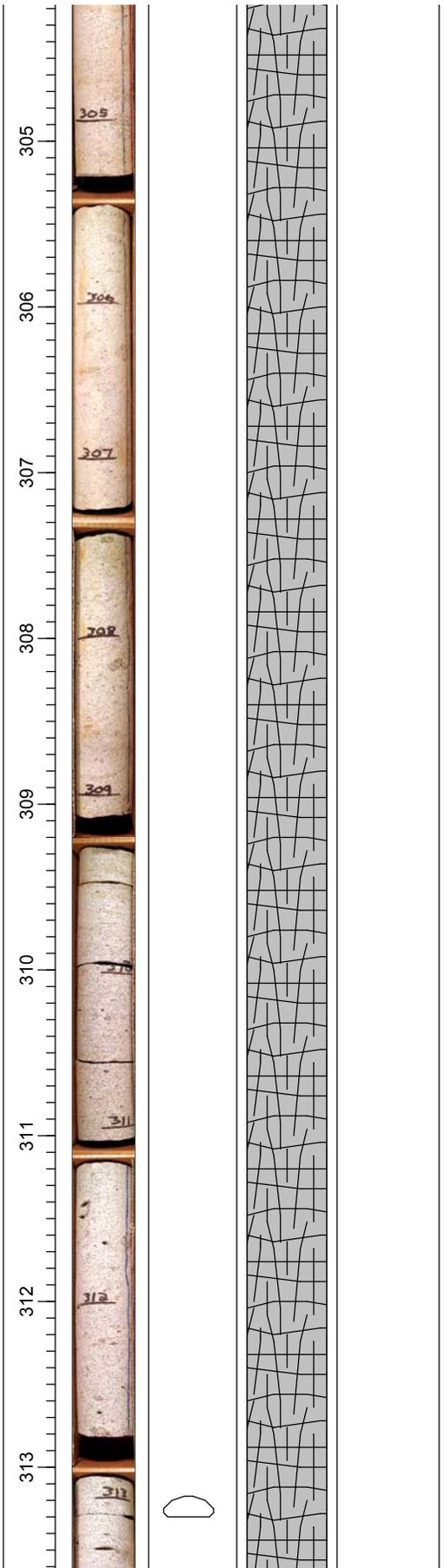


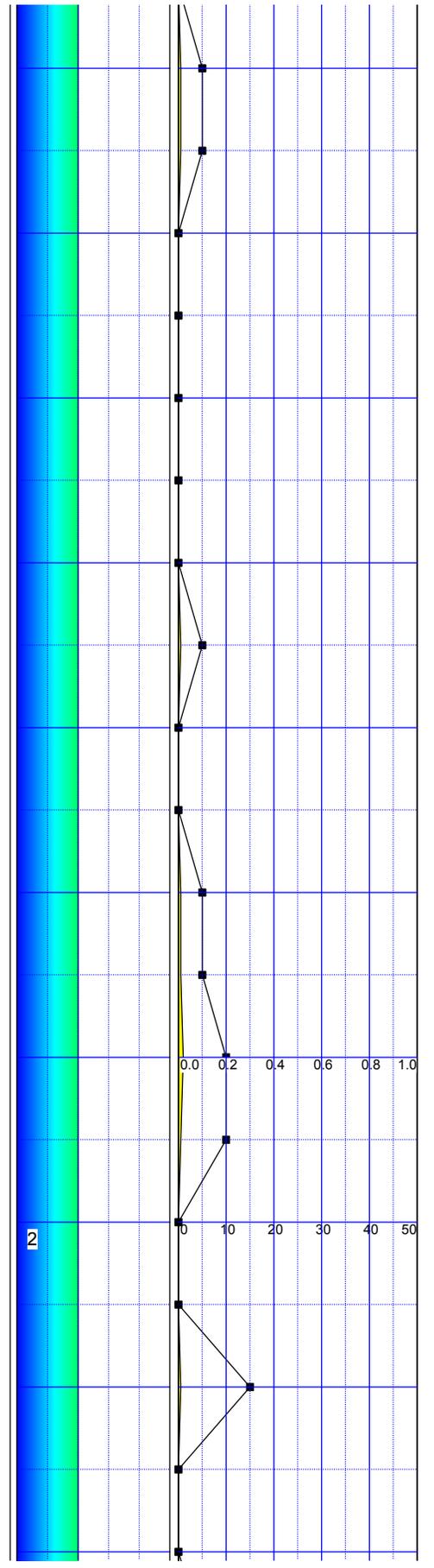
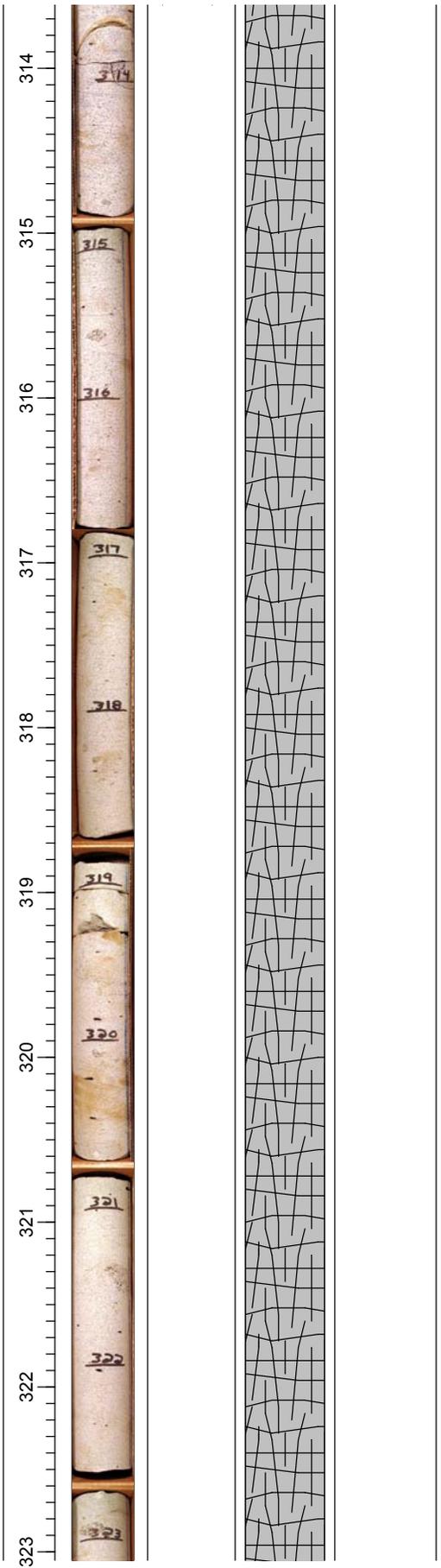


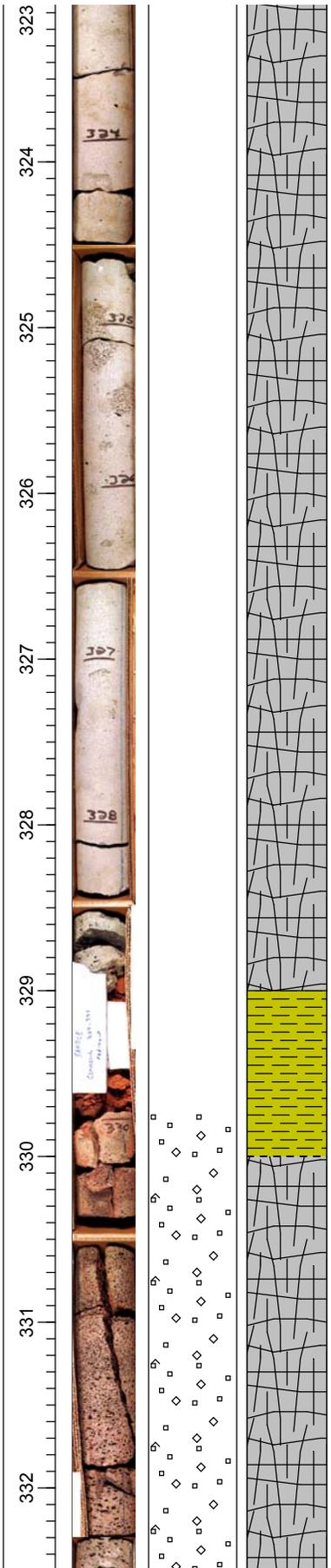






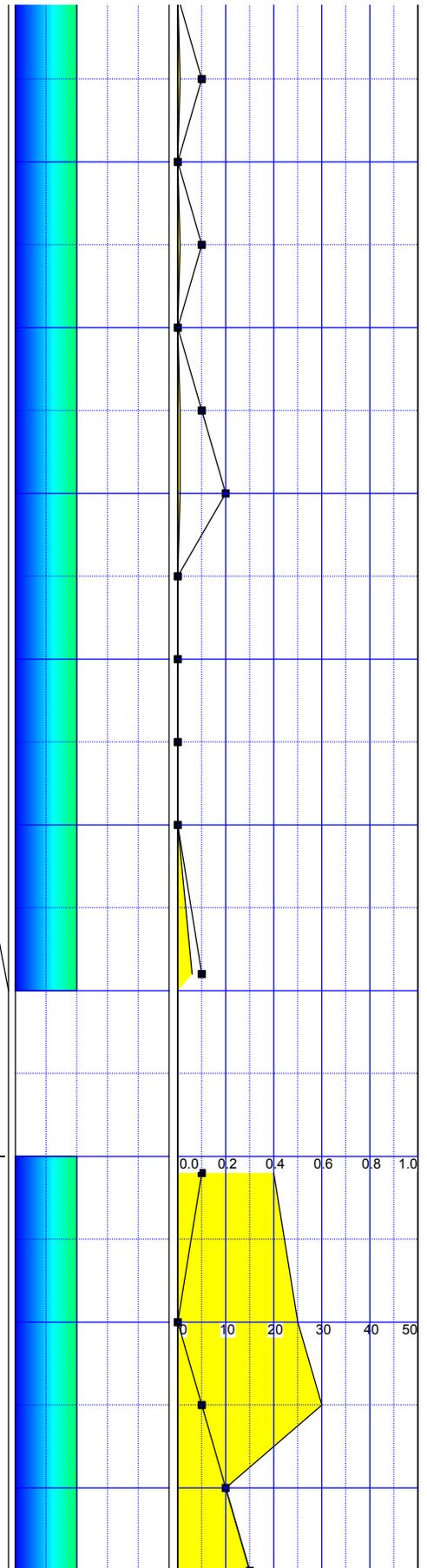


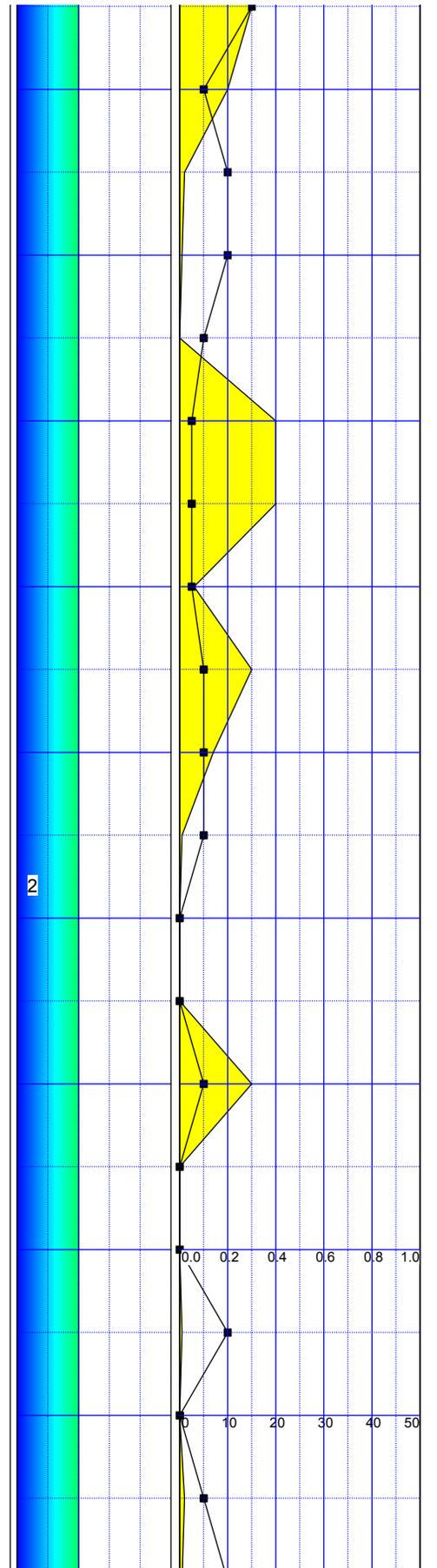
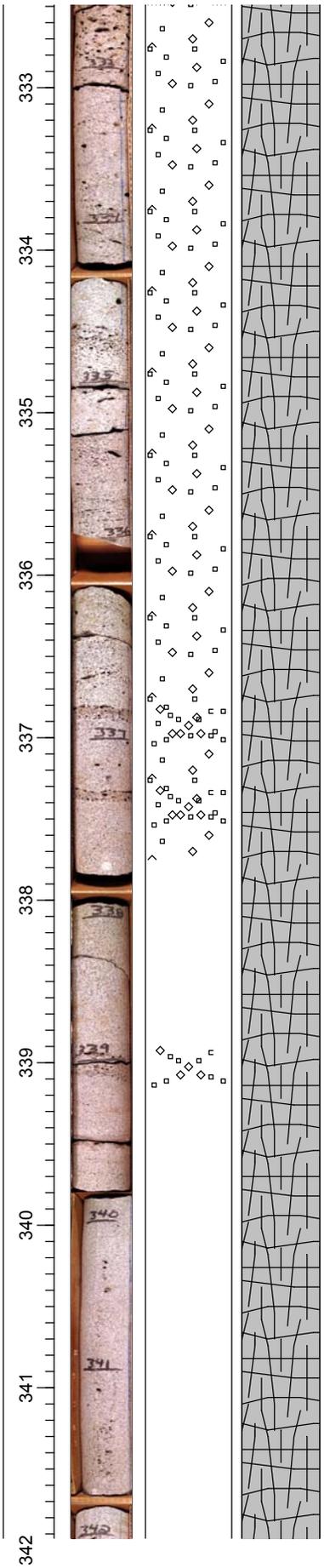


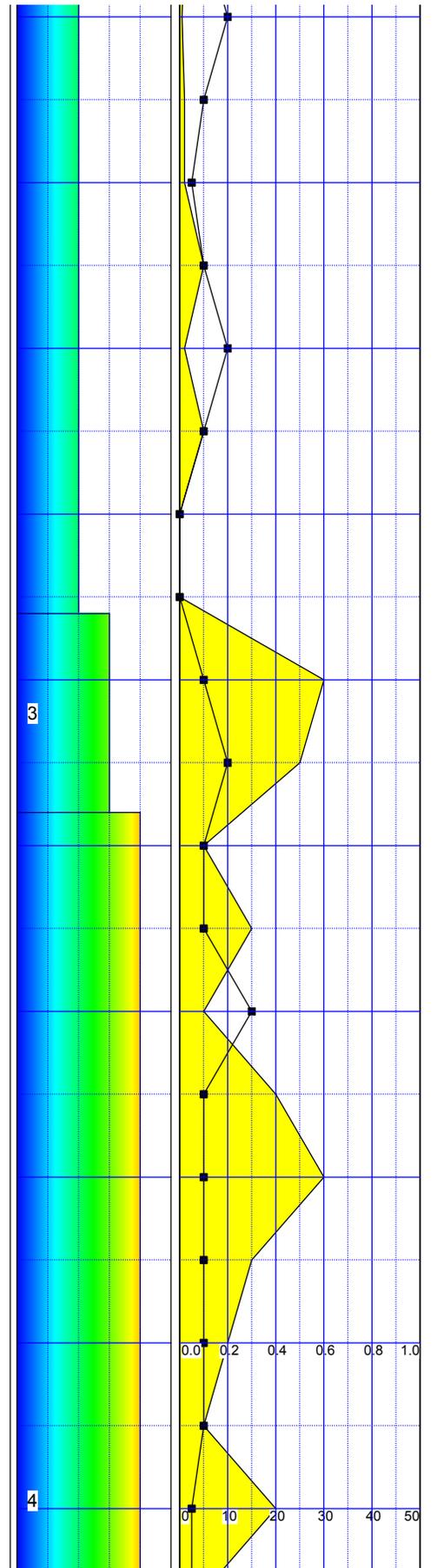
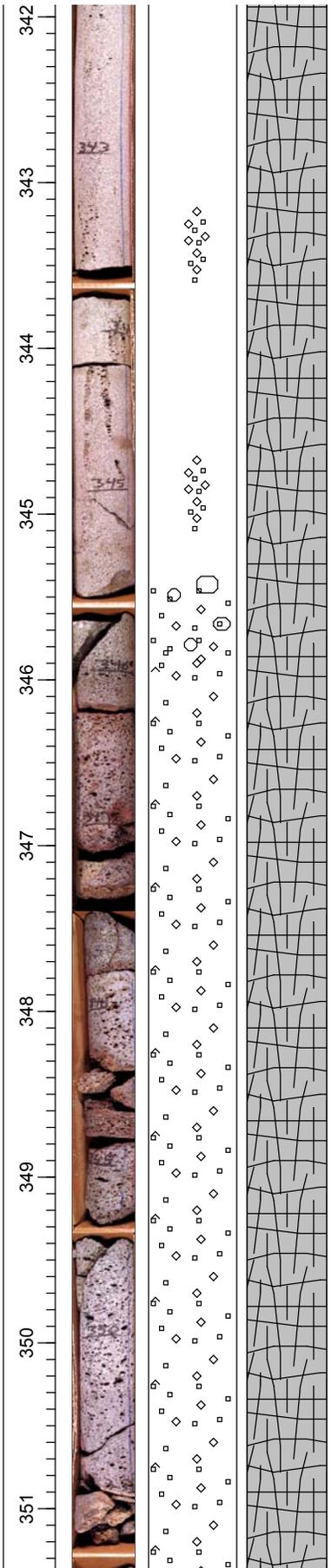


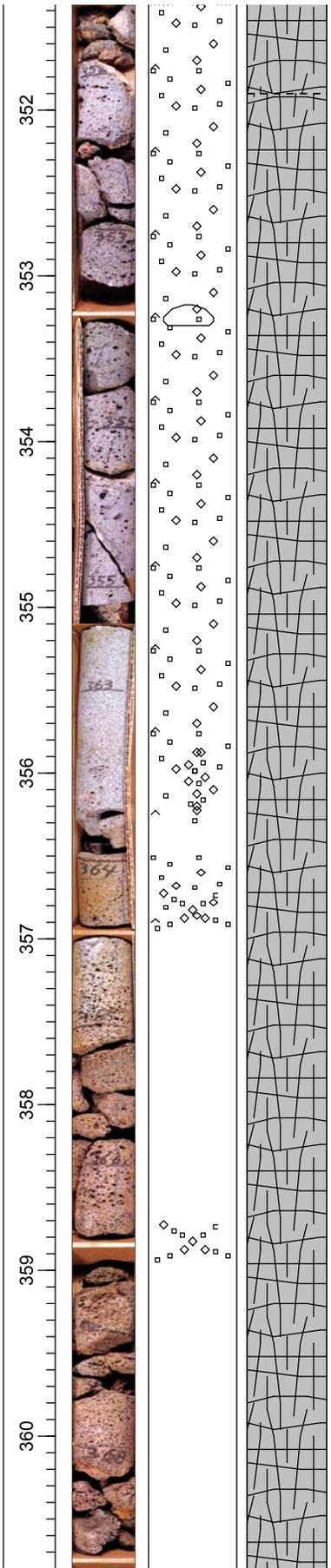
SILT AND CLAY:  
 COLOR: 10YR 6/6 Reddish Orange  
 TEXTURE: Silt with fines, USCS  
 Classification Silt and Clay ML  
 STRUCTURE: Structureless, massive  
 CONSISTENCY: Firm  
 CARBONATES: None noted  
 ROCKS: Some submillimeter plagioclase  
 clasts, few 1 to 2 millimeter size basalt  
 clasts  
 ROOTS/FOSSILS: None noted

BASALT:  
 COLOR: 5R 4/2 Grayish Red and 5YR 3/2  
 Grayish Brown grading to N5 Medium Gray  
 TEXTURE: Aphanitic basalt; vesicular at  
 top and base of interval, massive texture  
 from 337.5 feet to 345.7 feet, vesicle  
 planes at 336.9 feet, 337.4 feet, and 339.0  
 feet, vesicle cylinders present at 343.4  
 feet and 344.9 feet, rubbly zone at base  
 COMPOSITION: Average composition is 20%  
 plagioclase, 10% olivine, 5% pyroxene, and  
 65% groundmass; some submillimeter anhedral  
 to rare submillimeter subhedral olivine,  
 some submillimeter plagioclase laths, rare  
 submillimeter tabular plagioclase laths  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 7/4 Grayish Orange  
 calcitic mud in fractures, rare calcite  
 infilling of vesicles, heavy alteration of  
 olivine to iddingsite near the top and  
 base of interval with rare alteration near  
 the middle of the interval









**BASALT:**

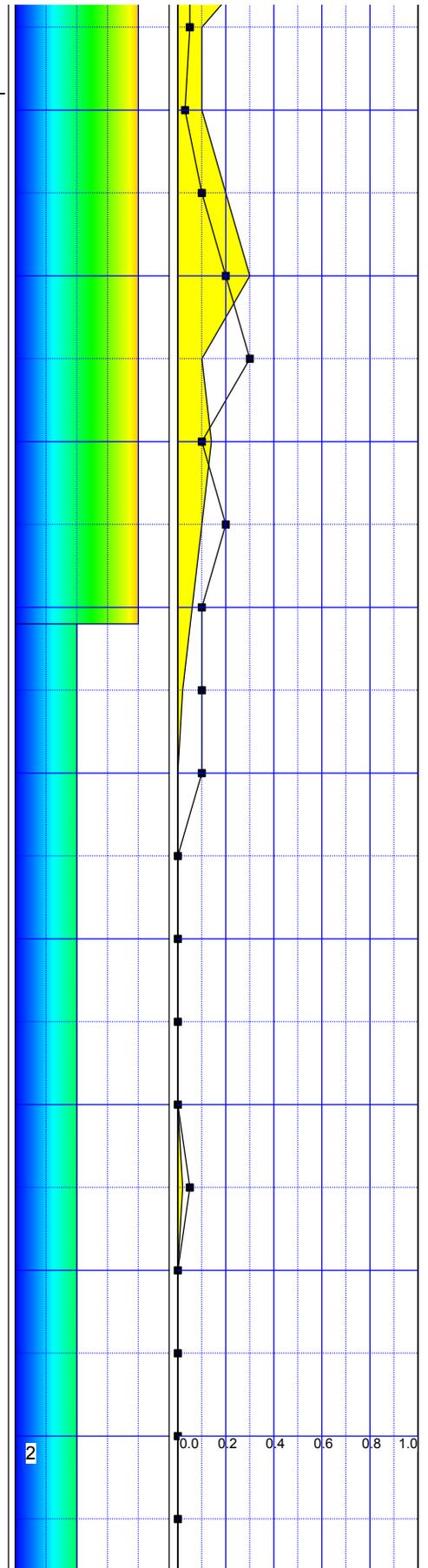
**COLOR:** 5YR 4/1 Brownish Gray at top and bottom of the interval grading to and from N4 Medium Gray in middle

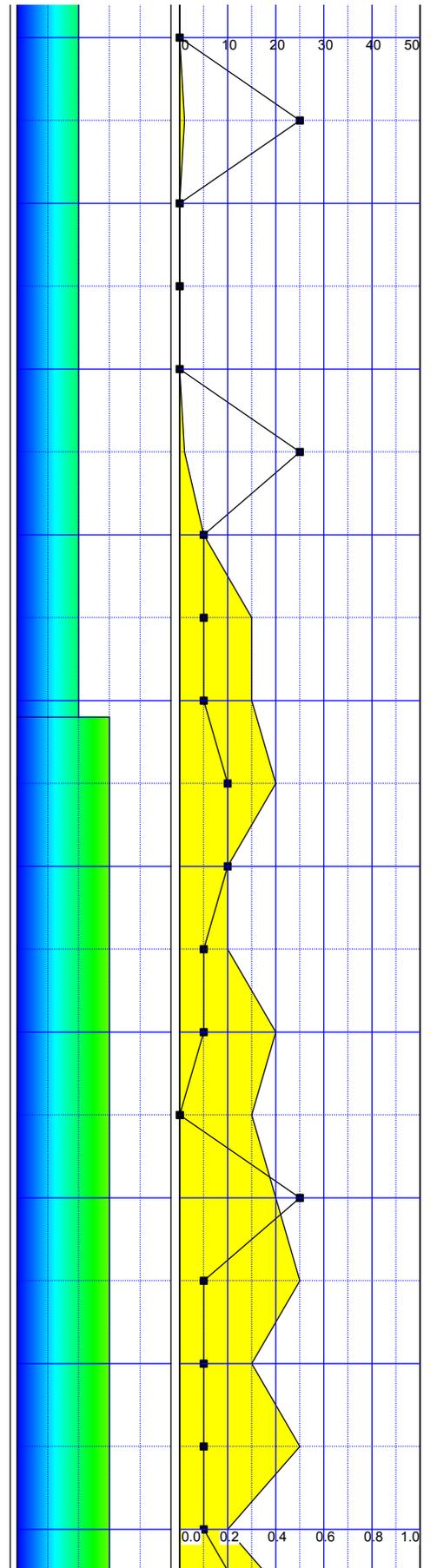
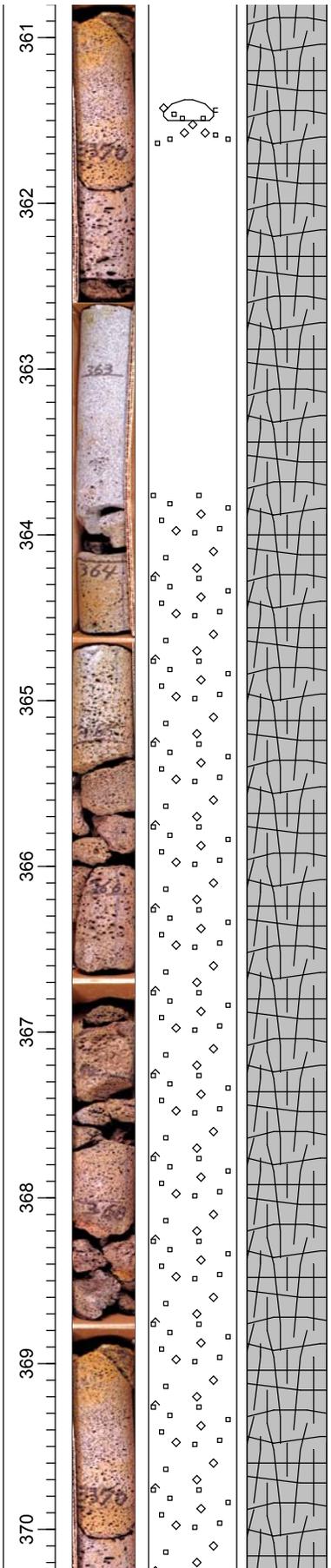
**TEXTURE:** Aphanitic, vesicular basalt; vesicular from 351.9 feet to 356.9 feet, massive from 356.9 feet to 364.0 feet, vesicular from 364.0 feet to 376.2 feet, diktytaxitic texture present from 369.0 feet to 375.5 feet; vesicle planes at 356.8 feet, 358.8 feet, and 361.5 feet, megavesicles at 353.2 feet and 361.4 feet, vesicle cylinder present at 356.1 feet, rubbly zone at base

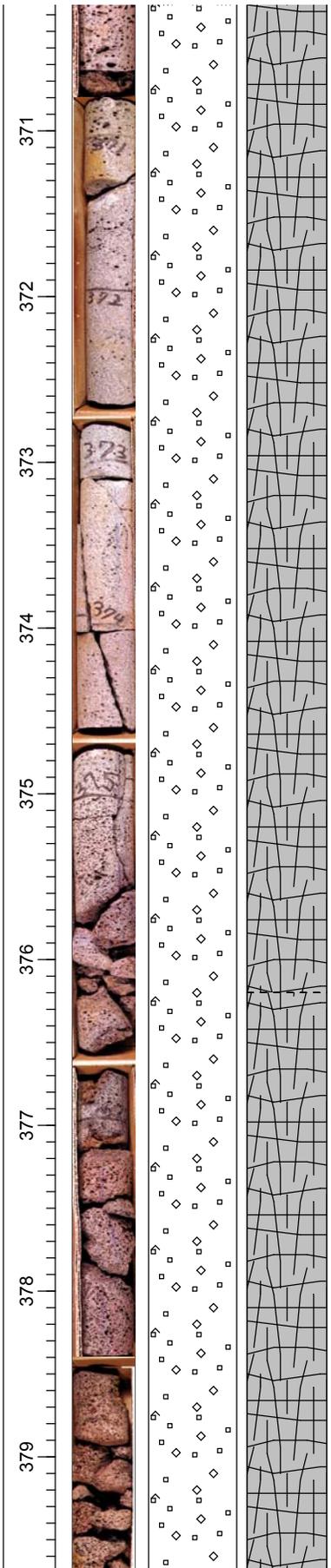
**COMPOSITION:** 25% plagioclase, 5% olivine, 2% pyroxene, 68% groundmass; submillimeter to rare 1 millimeter plagioclase laths, rare submillimeter tabular plagioclase laths, anhedral to subhedral submillimeter olivine microcrysts, groundmass is mostly red

**XENOLITHS/AUTOLITHS:** None noted

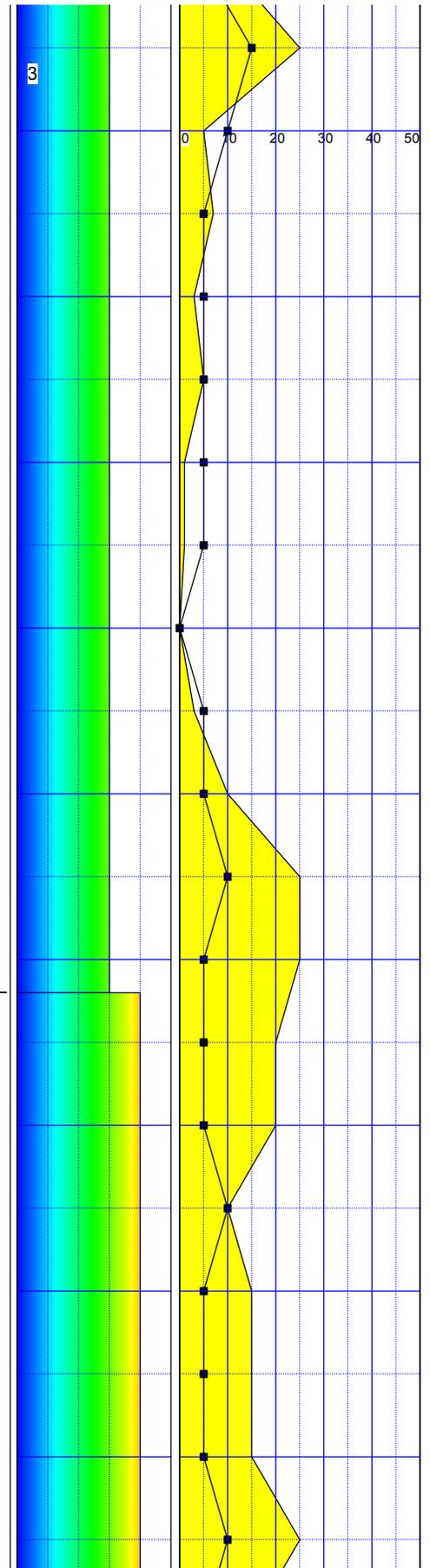
**ALTERATION:** Some 5YR 6/4 Light Brown calcitic mud present in fractures, moderate alteration of olivine to iddingsite

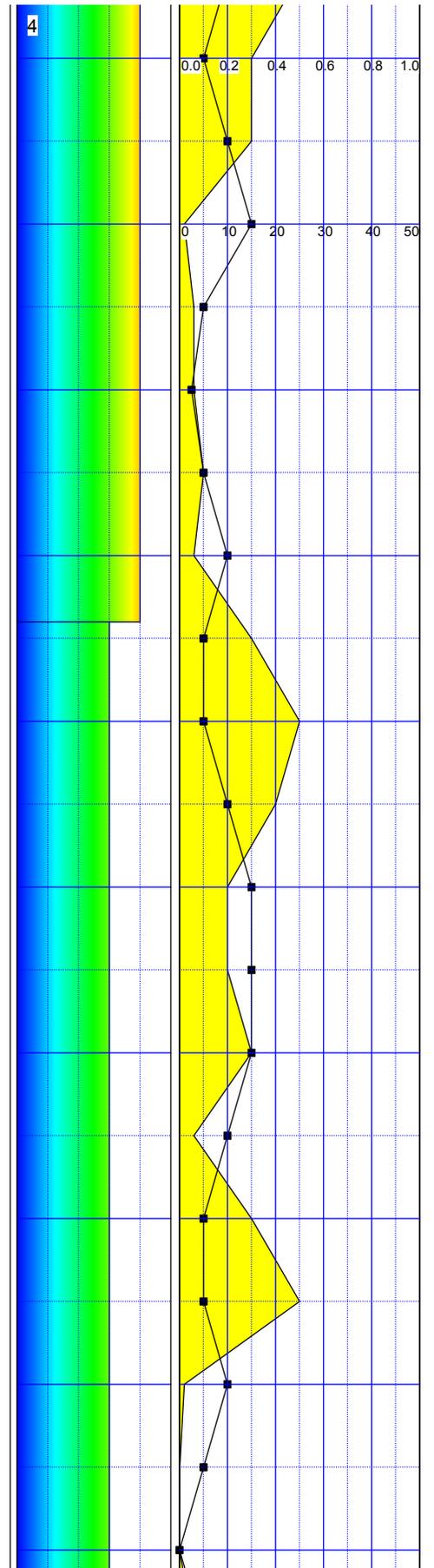
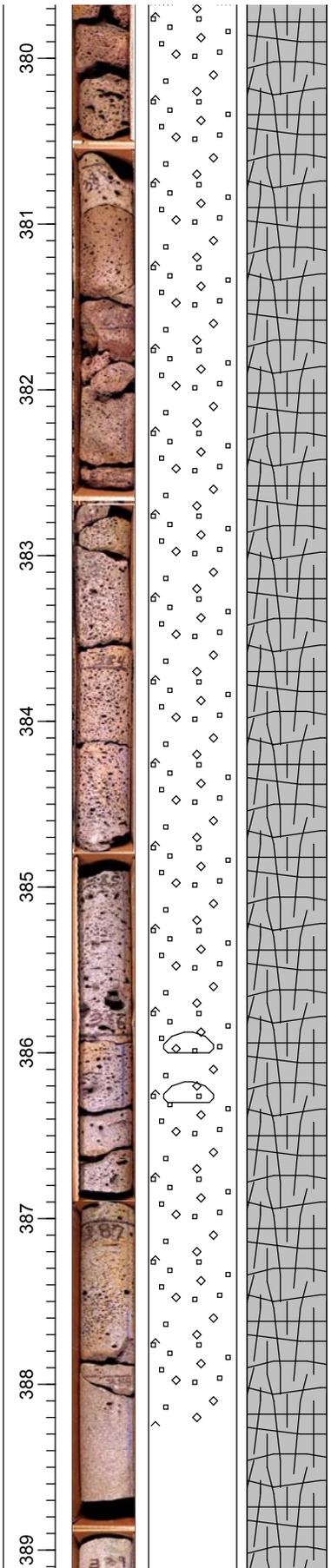


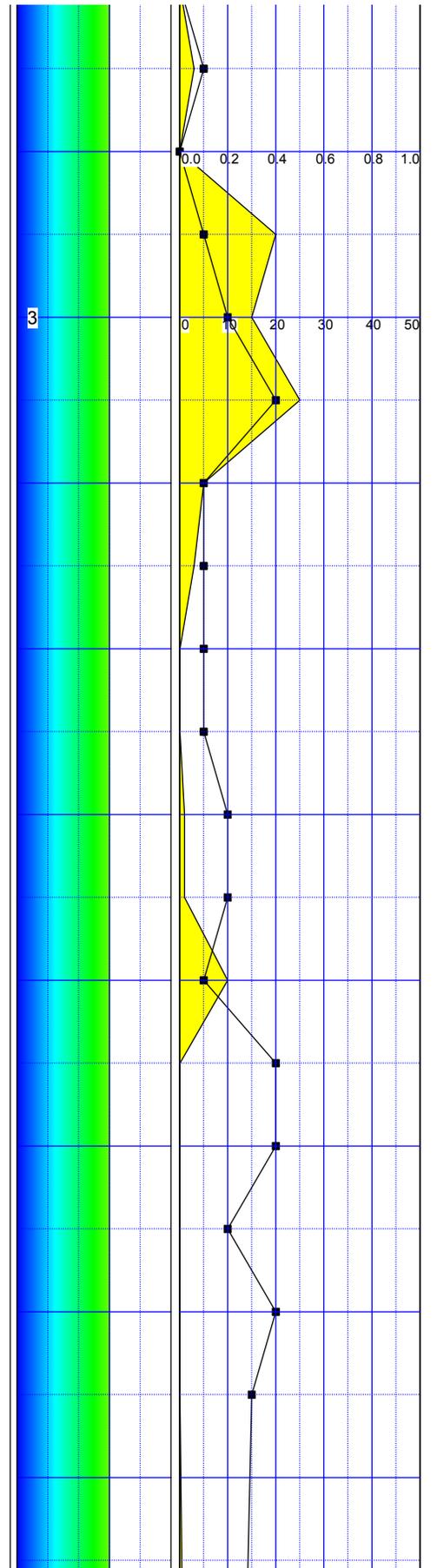
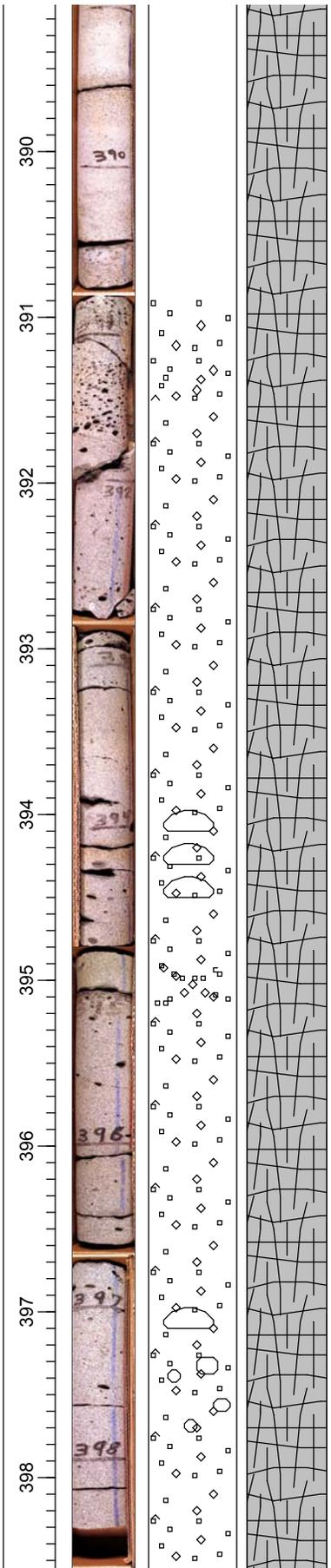


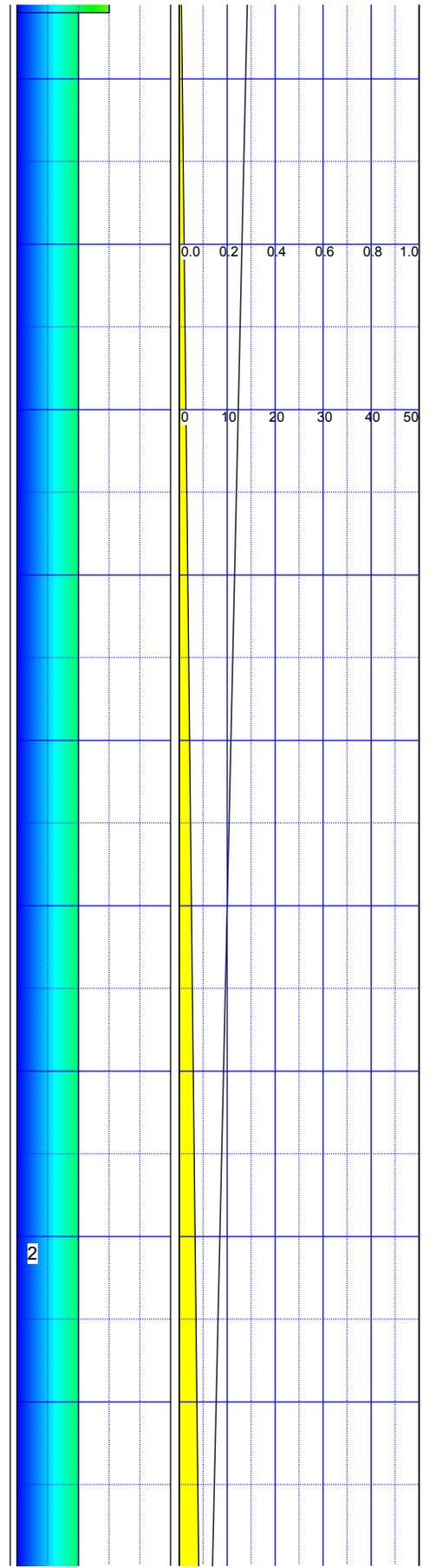
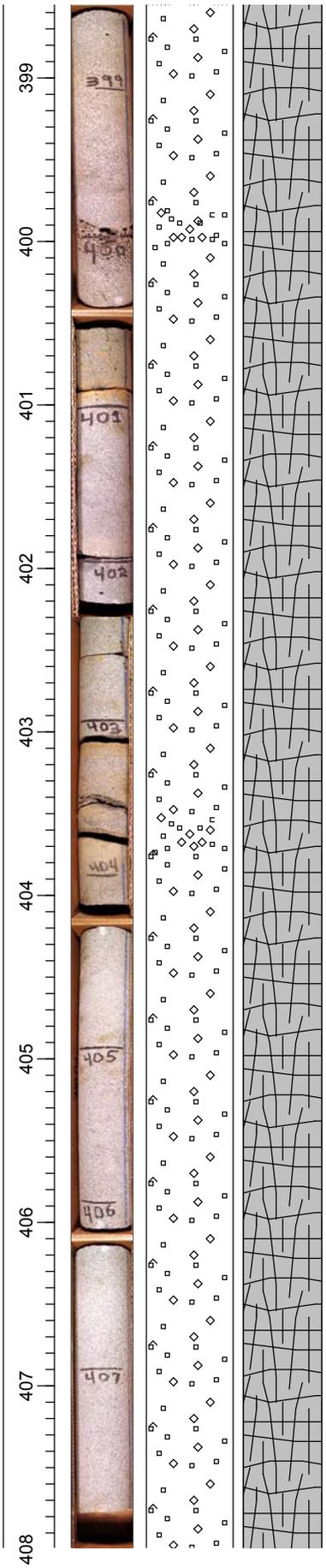


BASALT:  
 COLOR: 10R 4/2 Grayish Red grading to N5 Medium Gray  
 TEXTURE: Aphanitic, diktytaxitic basalt; diktytaxitic texture can be seen throughout the interval, vesicular from 376.2 feet to 388.0 feet, massive from 388.0 feet to 390.9 feet, vesicular from 390.9 feet to 397.7 feet, massive from 397.7 feet to 413.6 feet; vesicle planes at 395.0 feet, 399.9 feet, 403.6 feet, and 410.4 feet, large vesicles at 345.6 feet and 397.5 feet, megavesicles at 385.9 feet, 386.2 feet, 394.0 feet, 394.2 feet, 394.4 feet, 397.0 feet, and 400.0 feet  
 COMPOSITION: 50% plagioclase, 20% olivine, 5% pyroxene, 25% groundmass; submillimeter to 1 millimeter plagioclase laths, some submillimeter tabular plagioclase laths, submillimeter to 3 millimeter euhedral to anhedral olivine microcrysts and phenocrysts, euhedral to rare subhedral pyroxene, very rare acicular phenocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 5YR 5/2 Pale Brown calcite mud present in some fractures, some alteration of olivine to iddingsite

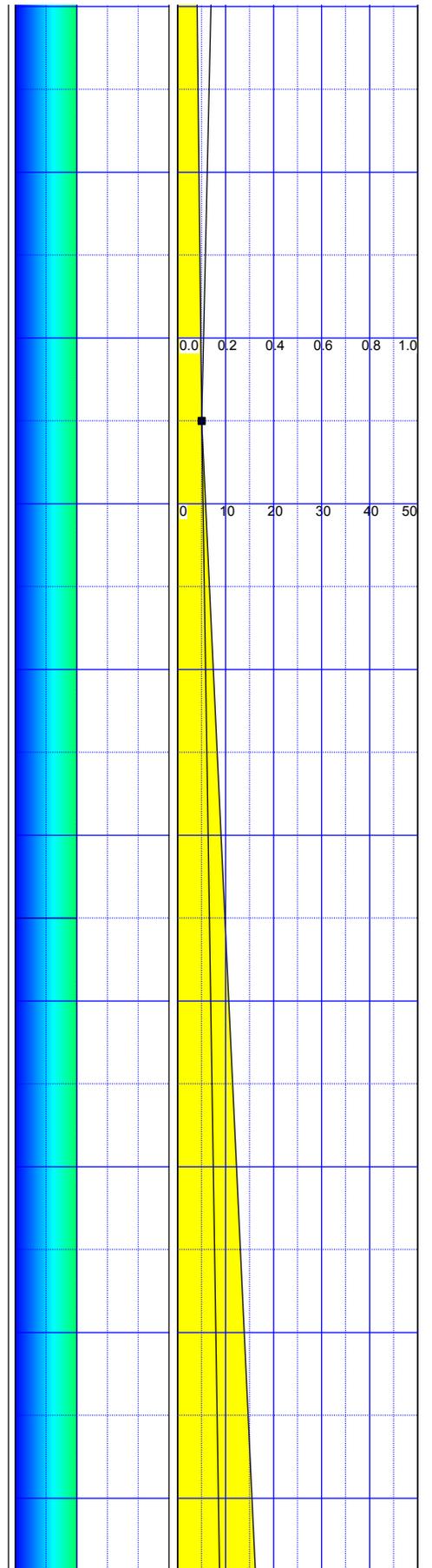
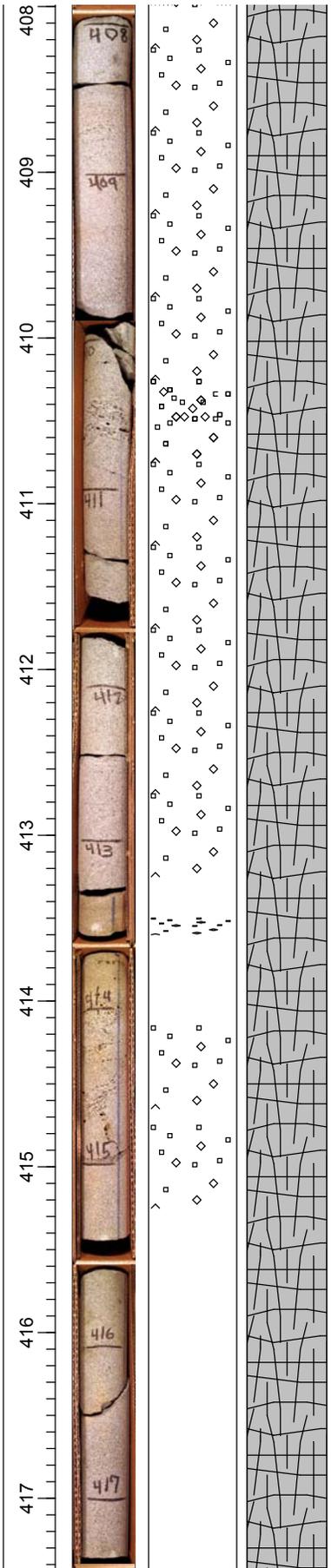


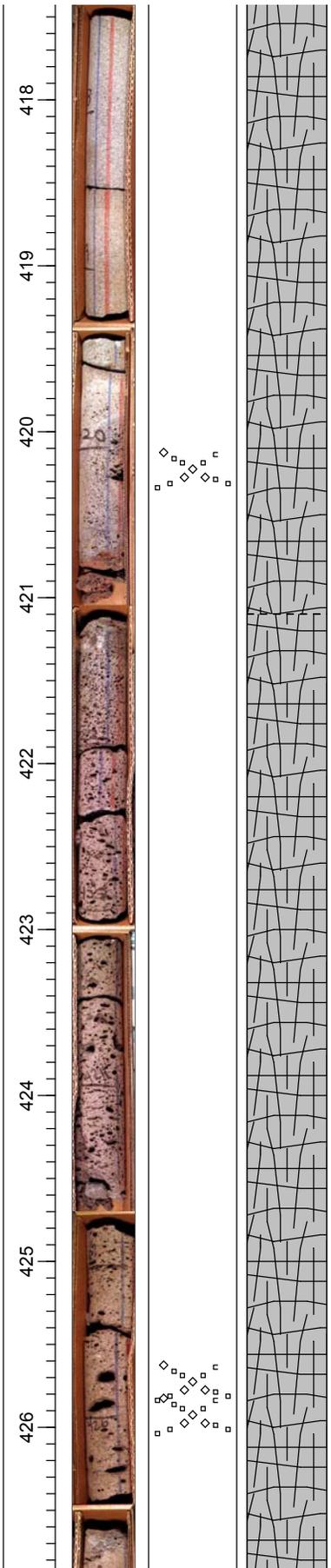




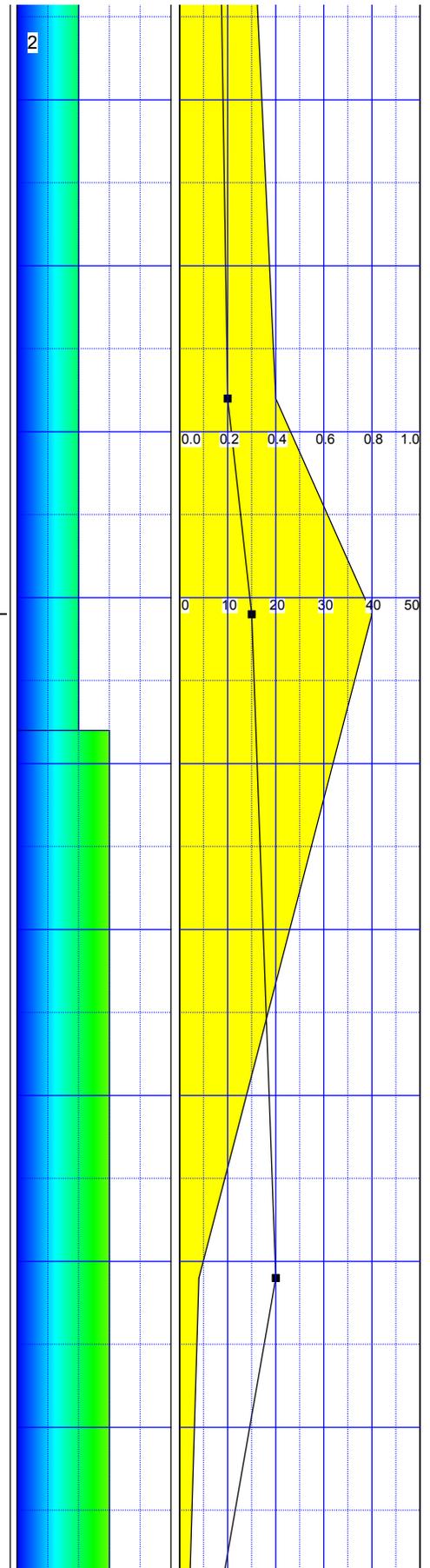


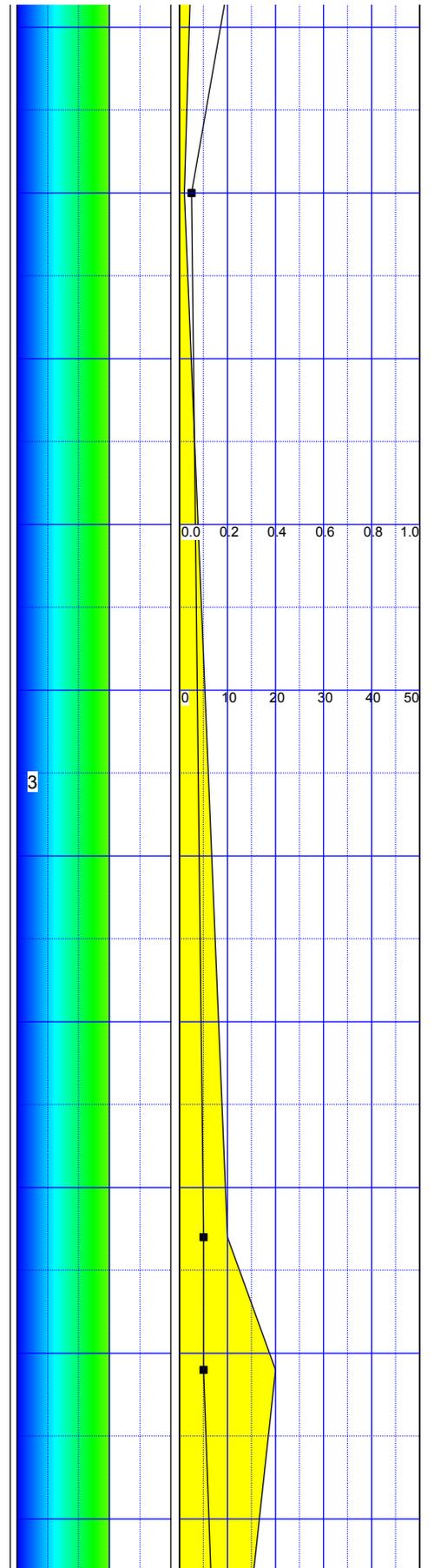
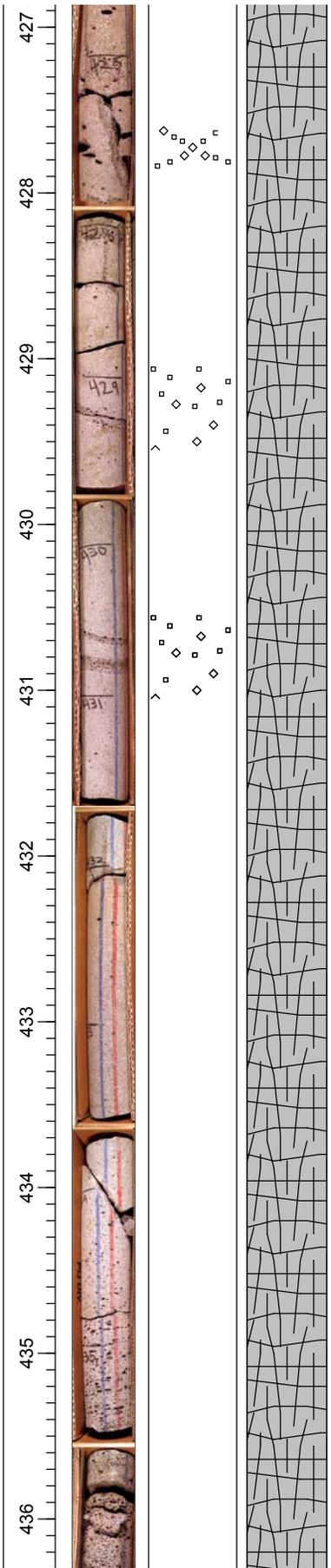
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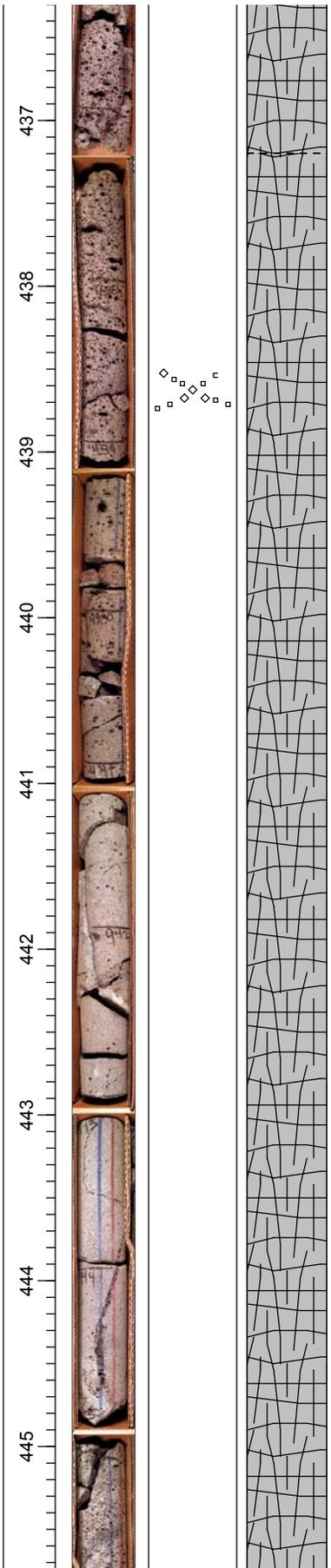




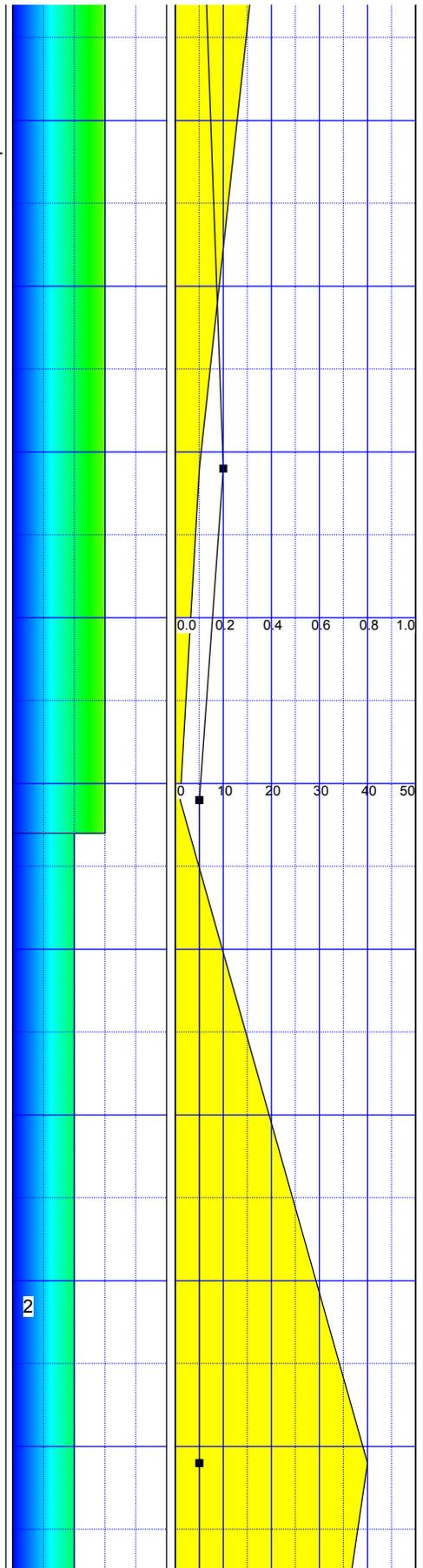
BASALT:  
 COLOR: 5YR 3/2 Grayish Brown grading to N5 Medium Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicular from 421.1 feet to 428.0 feet, massive from 428 feet to 437.2 feet; vesicle planes at 429.3 feet, 430.8 feet, and 430.9 feet; rubbly zone at base  
 COMPOSITION: 40% plagioclase, 35% olivine, 1% pyroxene, 24% groundmass; plagioclase is submillimeter laths; olivine is mostly submillimeter anhedral microcrysts; pyroxenes are submillimeter anhedral to subhedral  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 Very Pale Orange calcitic mud in vesicles near top; N8 Very Light Gray calcite in fractures near bottom; moderate alteration to iddingsite

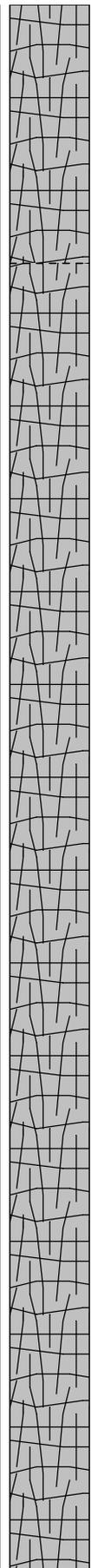
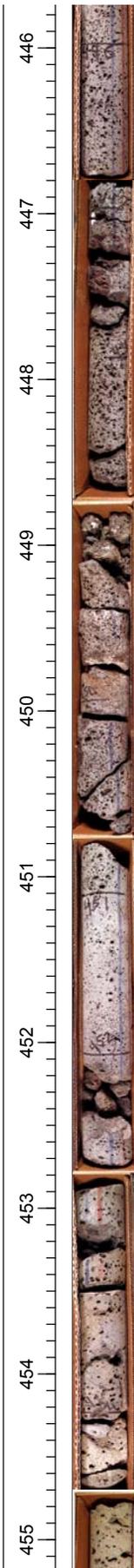




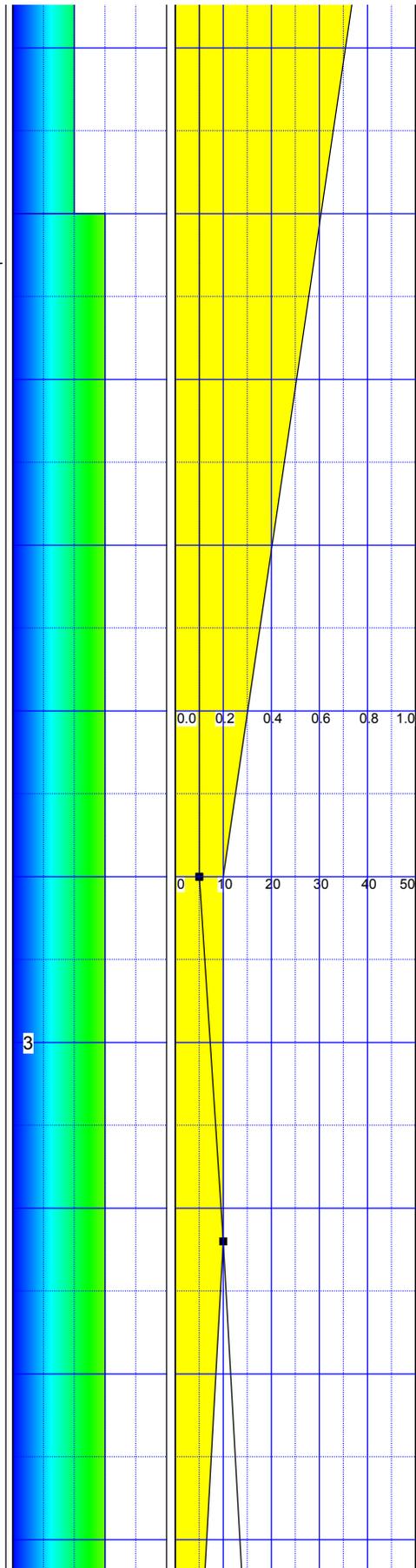


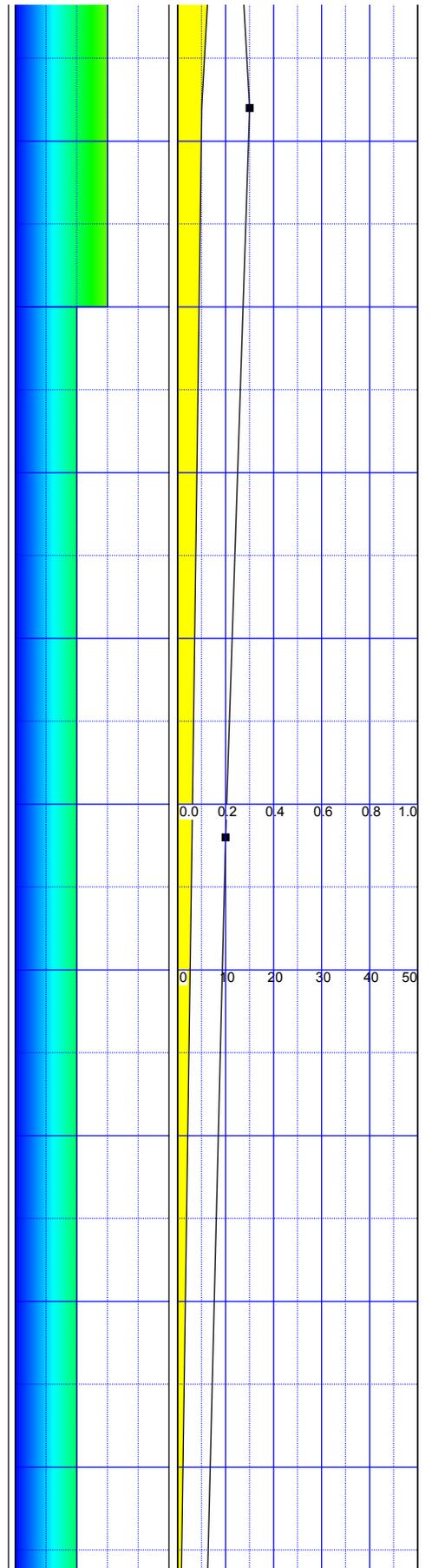
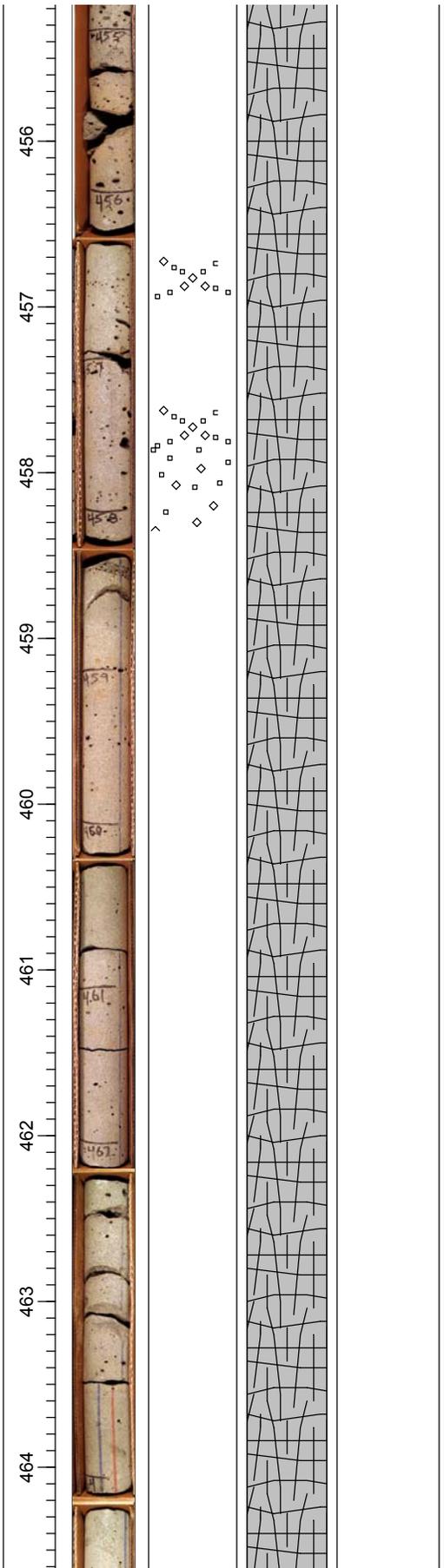
**BASALT:**  
 COLOR: 5YR 4/1 Brownish Gray grading to N4 Medium Dark Gray  
 TEXTURE: Aphanitic, diktytaxitic basalt; vesicular from 437.2 feet to 439.1 feet, massive from 439.1 feet to 441.1 feet, vesicular from 441.1 feet to 447.3 feet; rubbly zone at base  
 COMPOSITION: 35% plagioclase, 20% olivine, 1% pyroxene, 44% ground mass; plagioclase is submillimeter laths, olivine is mostly submillimeter anhedral microcrysts to rare 1 millimeter anhedral to subhedral microcrysts, very rare 1 millimeter subhedral to anhedral pyroxenes  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 5YR Pinkish Gray calcitic mud in fractures

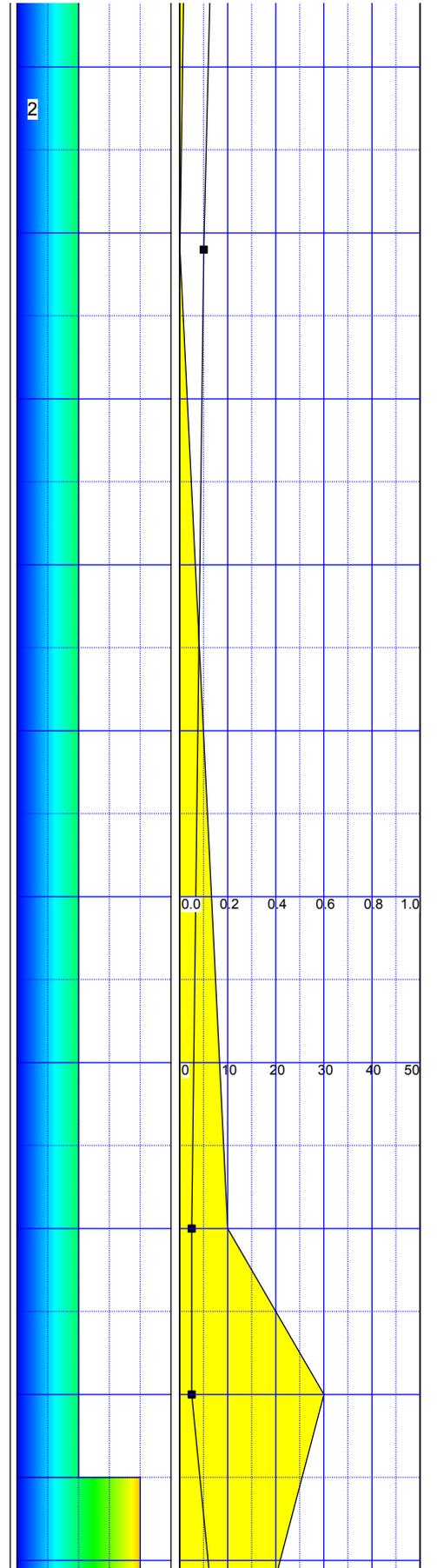
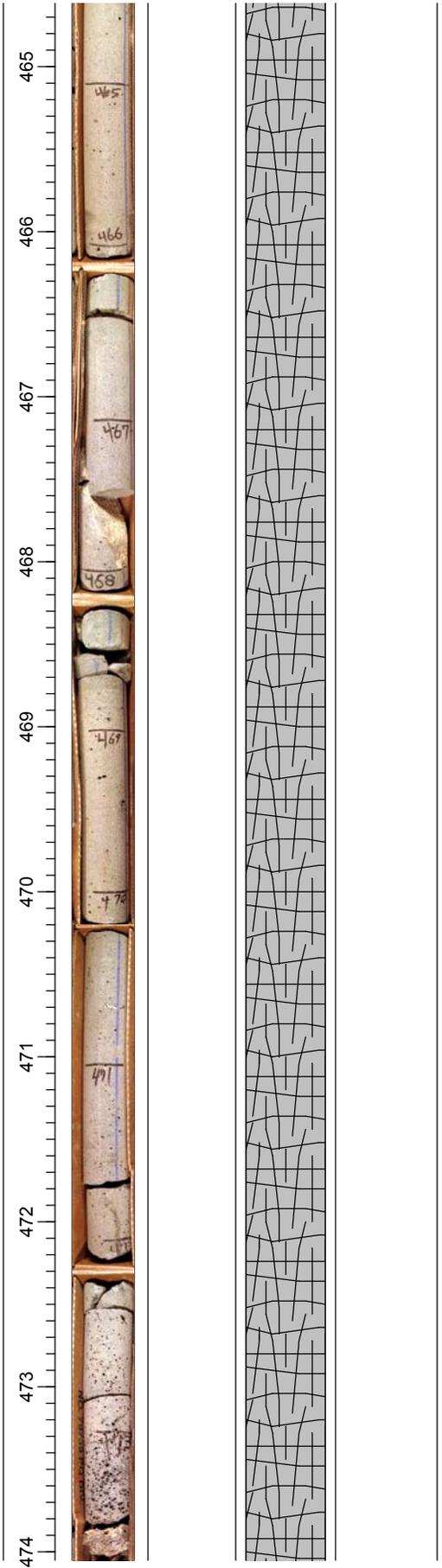


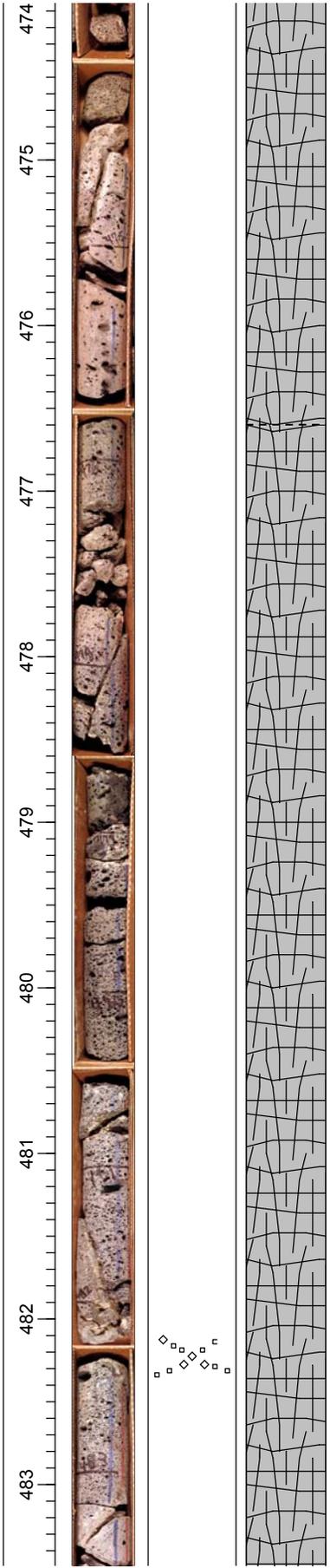


BASALT:  
COLOR: 5YR 4/1 0YR 4/2 Grayish Red grading to N4 Medium Dark Gray  
TEXTURE: Aphanitic basalt; vesicular from 447.3 feet to 451.0 feet, massive from 451.0 feet to 455.8 feet, vesicular from 455.8 feet to 466.1 feet, massive from 466.1 feet to 473.0 feet, vesicular from 473.0 feet to 476.2 feet  
COMPOSITION: 40% plagioclase, 25% olivine, 35% groundmass; plagioclase is submillimeter laths, olivine is submillimeter anhedral to subhedral microcysts  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 5YR 8/1 Pinkish Gray calcitic mud in fractures; slight alteration to iddingsite.

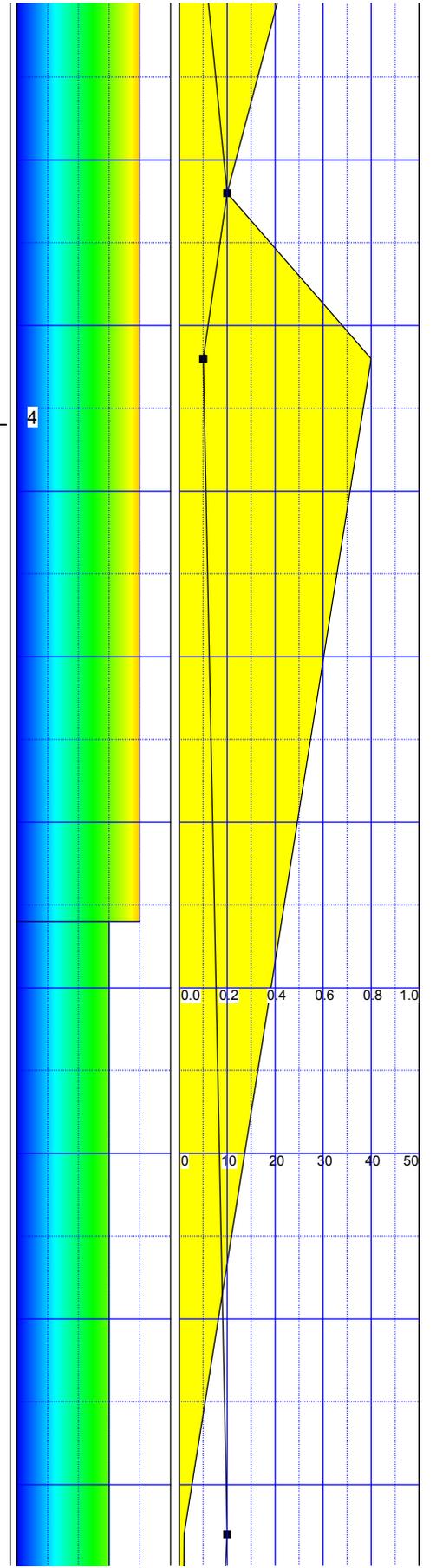


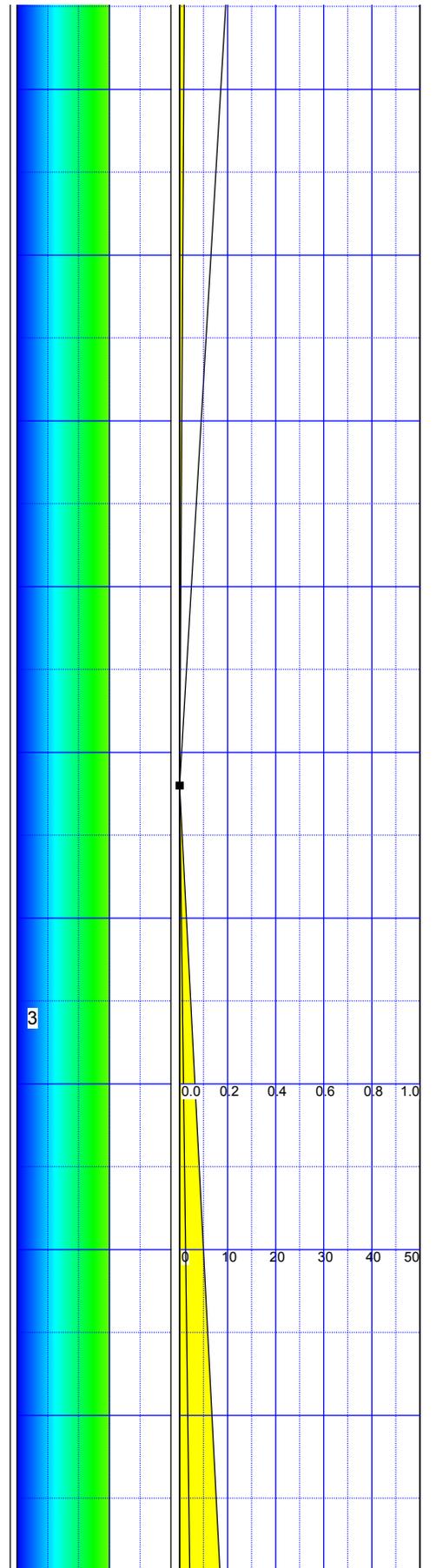
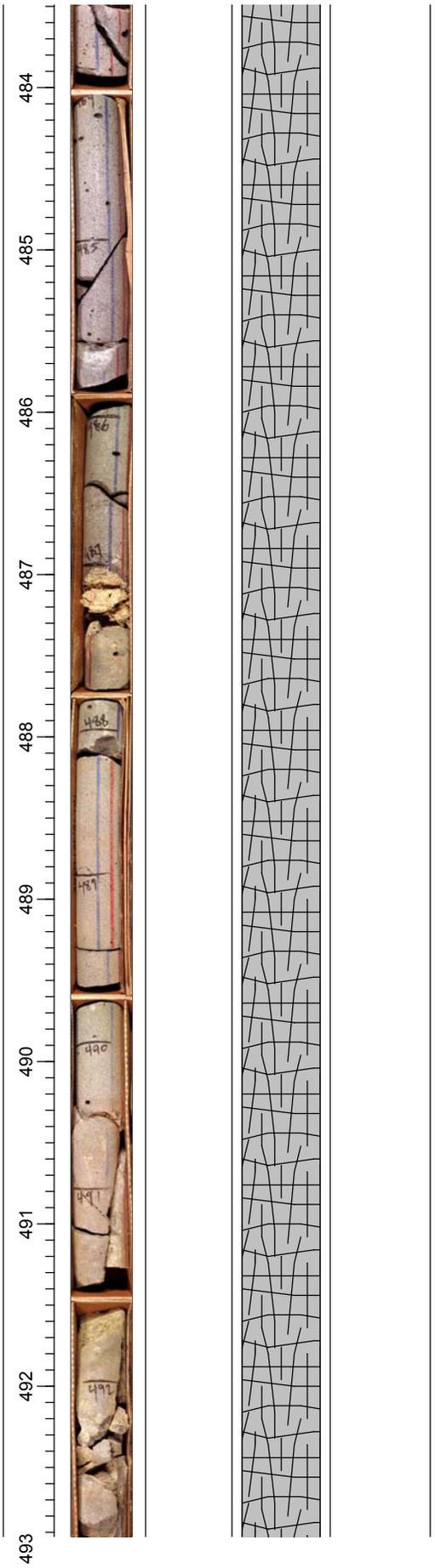


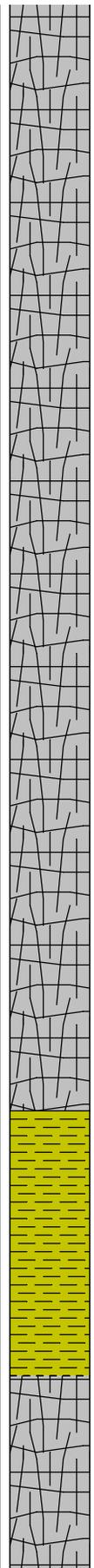
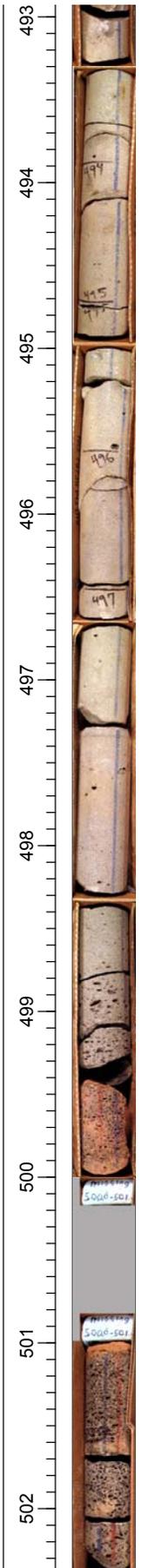




BASALT:  
 COLOR: 10YR 6/1 Light Brownish Gray grading to N5 Medium Dark Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicular from 476.2 feet to 483.3 feet, massive from 483.3 feet to 498.0 feet, vesicular from 498.0 feet to 499.6 feet  
 COMPOSITION: 40% plagioclase, 35% olivine, 25% groundmass; plagioclase is submillimeter laths; olivine is anhedral to subhedral submillimeter to 2 millimeter microcrysts and glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 0YR 8/2 Very Pale Orange calcitic mud is common in fractures; slight alteration to iddingsite

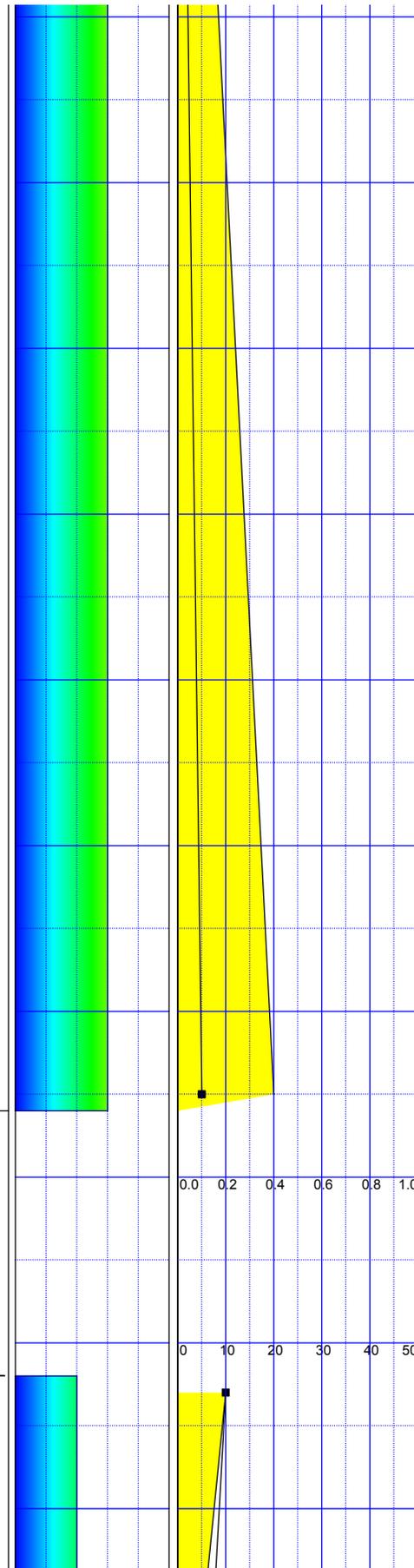


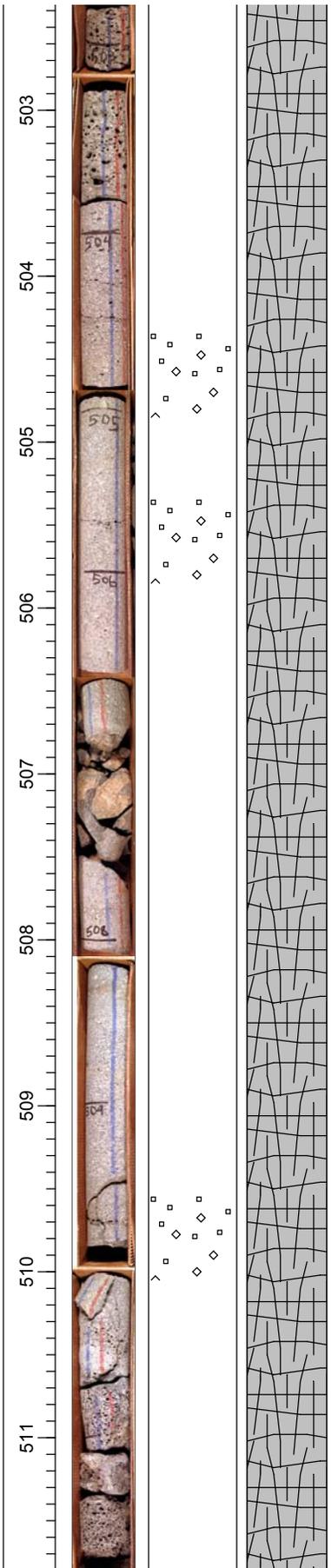




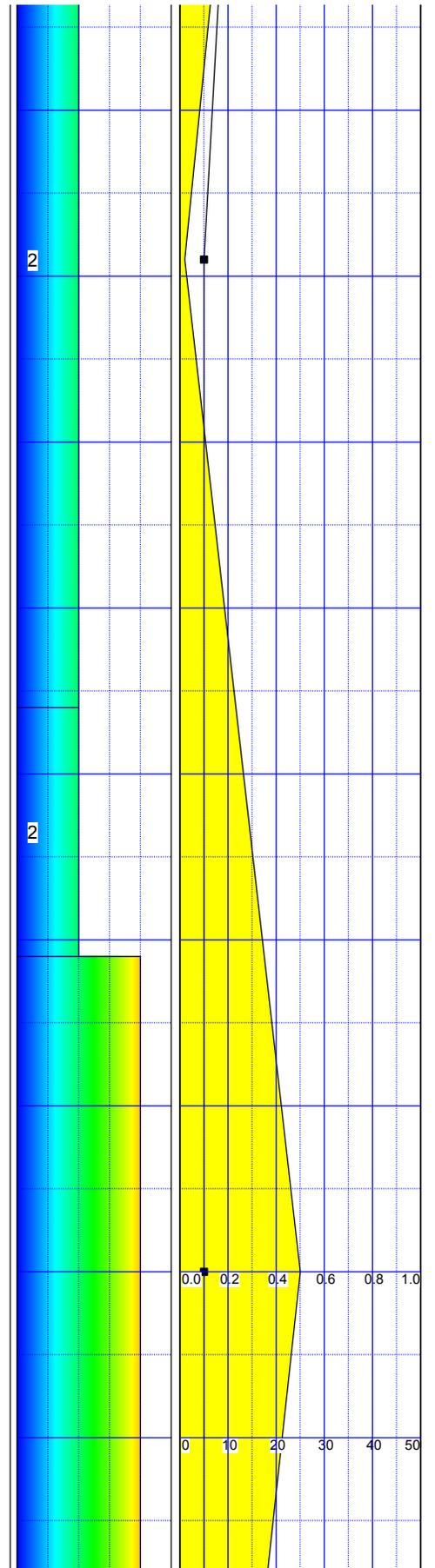
**SILT AND CLAY:**  
 COLOR: 6R 6/6 Moderate Reddish Orange  
 TEXTURE: Silt with fines, USCS  
 Classification Silt and Clay ML, grains are angular to subrounded  
 STRUCTURE: Structureless, massive  
 CONSISTENCY: Firm  
 CARBONATES: Cement is calcitic  
 ROCKS: None noted  
 ROOTS/FOSSILS: None noted

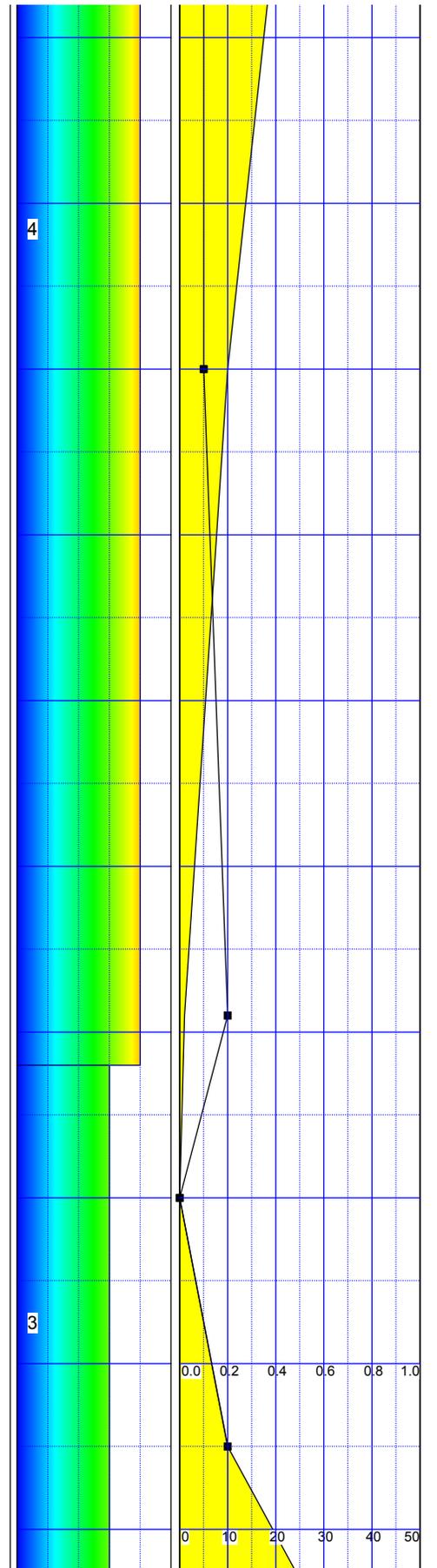
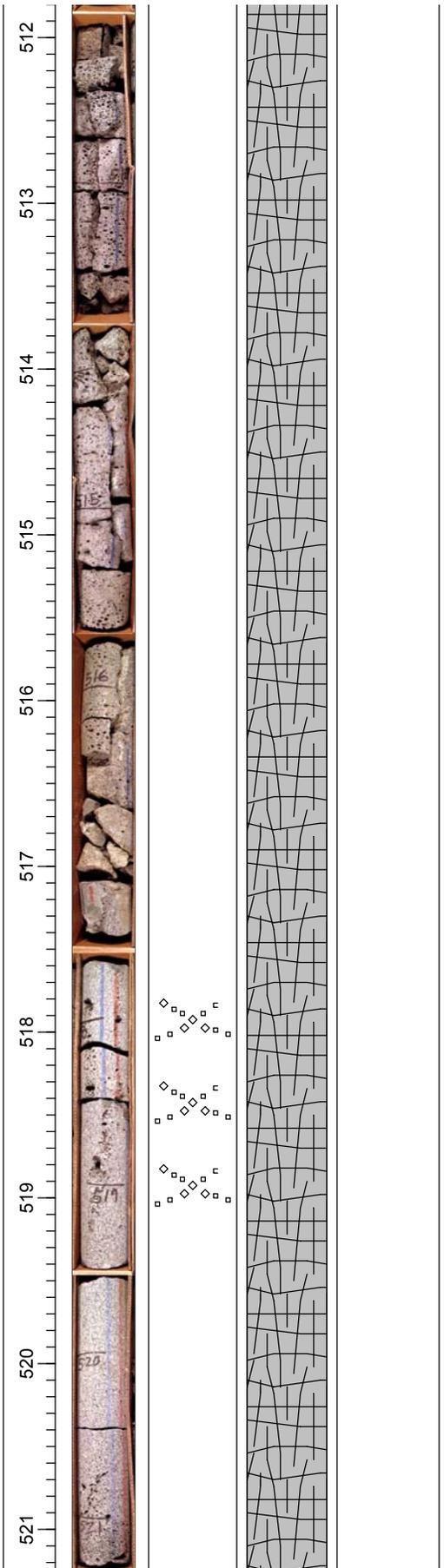
**BASALT:**  
 COLOR: N5 Medium Gray  
 TEXTURE: Aphanitic, diktytaxitic basalt; vesicular from 502.6 feet to 503.9 feet, massive from 503.9 feet to 510 feet, vesicular from 510 feet to 517.9 feet, massive from 517.9 feet to 519.0 feet, vesicular from 519.0 feet to 523.5 feet.  
 COMPOSITION: 60% plagioclase, 20% olivine, 20% groundmass; plagioclase is submillimeter laths with rare 1 millimeter tabular

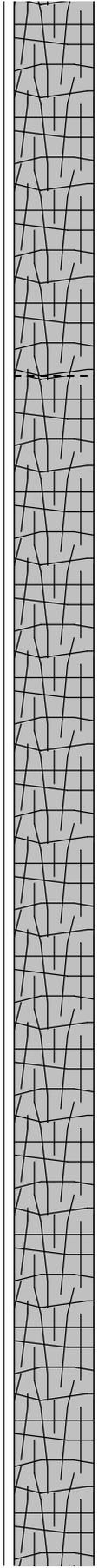
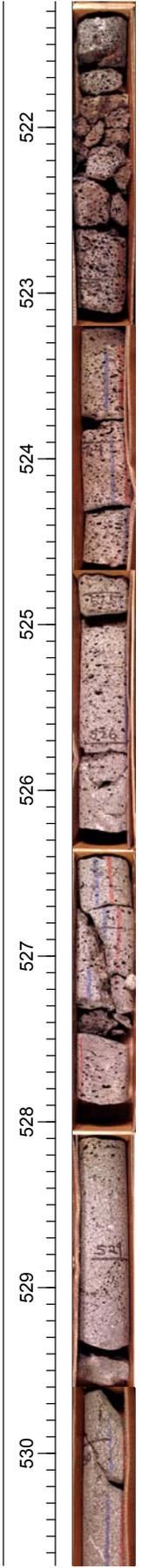




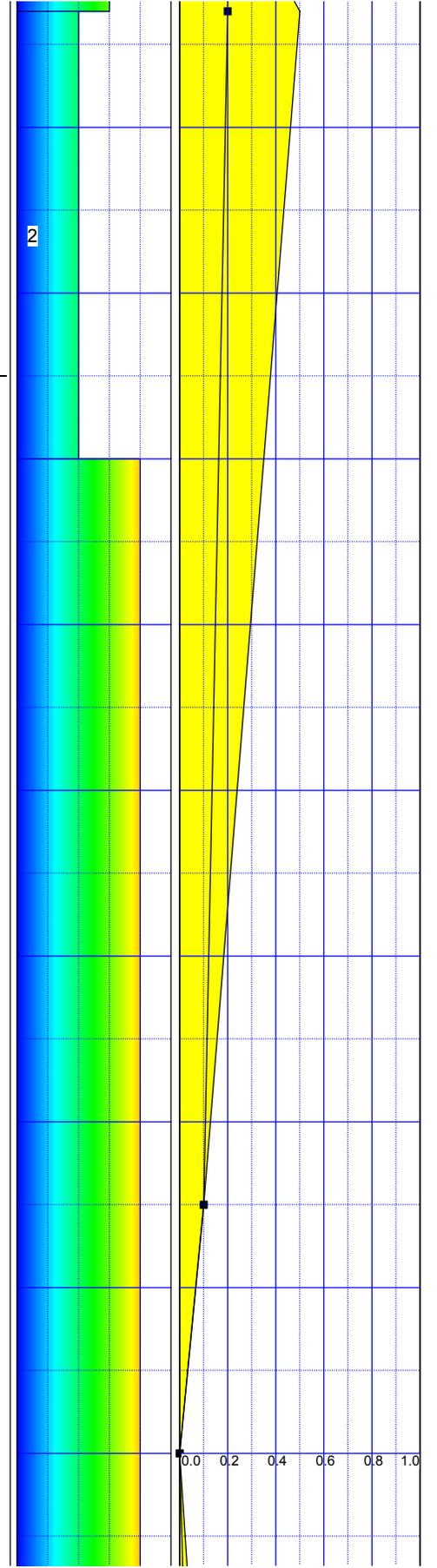
plagioclase laths; olivine is submillimeter anhedral microcrysts  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: Moderate alteration to iddingsite; 5YR 8/1 calcitic mud in fractures

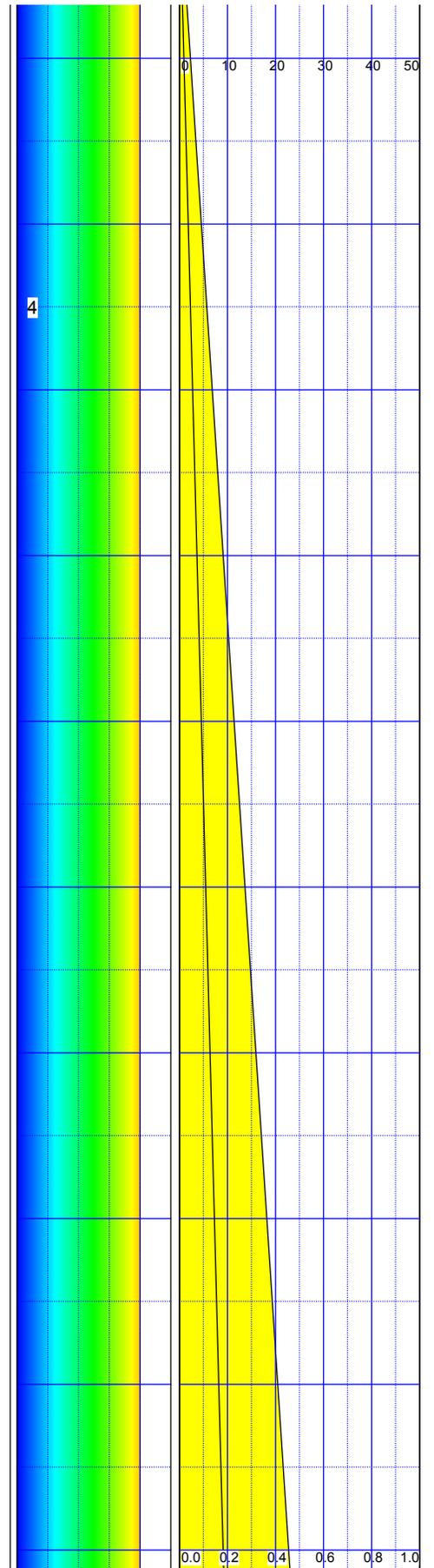
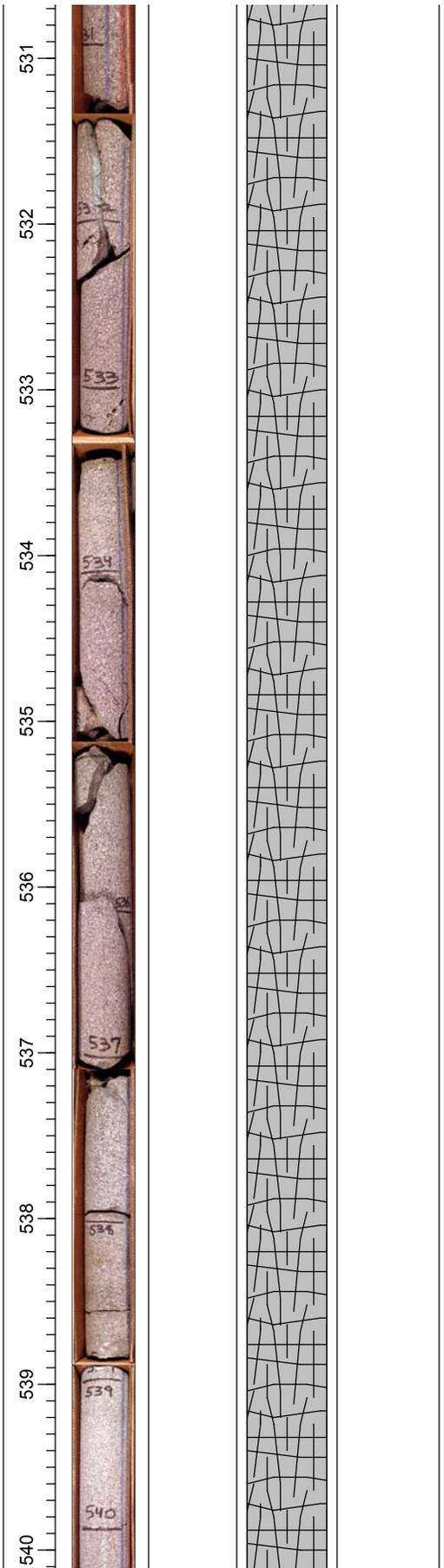


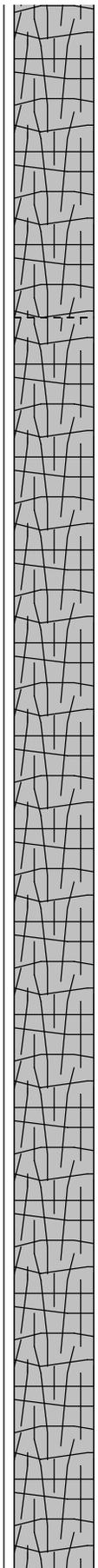




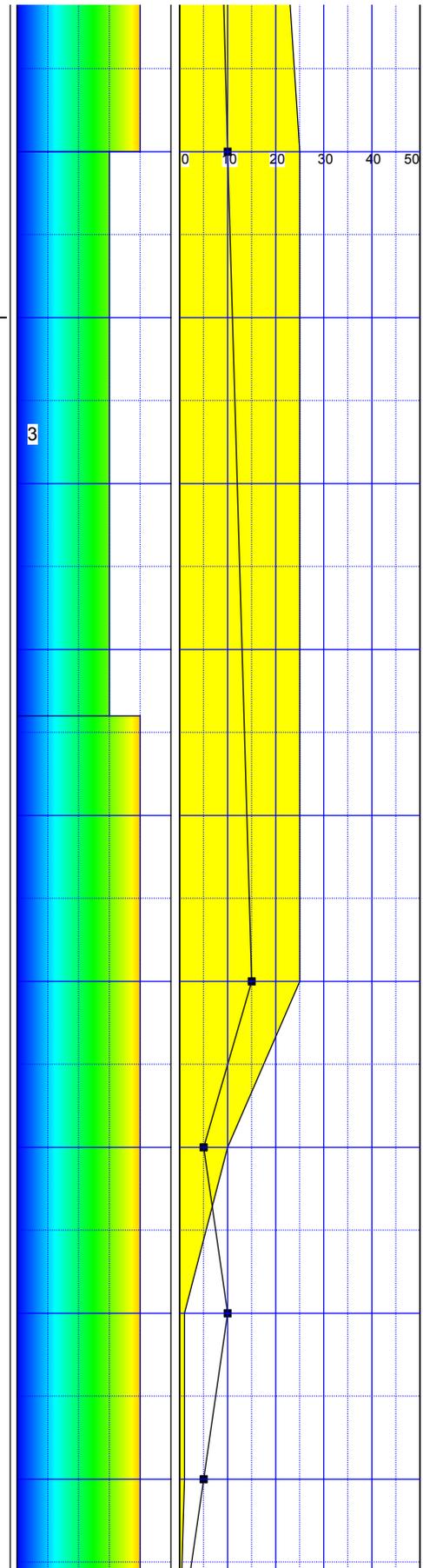
BASALT:  
COLOR: 10YR 4/1 Brownish Gray  
TEXTURE: Aphanitic, diktytaxitic basalt;  
vesicular from 523.5 feet to 528.5 feet,  
massive from 528.5 feet to 541.0 feet,  
vesicular from 541.0 feet to 542.0 feet.  
COMPOSITION: 35% plagioclase, 5% olivine, 5%  
pyroxene, 55% groundmass; plagioclase is  
submillimeter to 2 millimeter tabular laths;  
olivine is submillimeter anhedral  
microcrysts  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 10YR 8/2 calcitic mud in  
fractures; moderate alteration to iddingsite

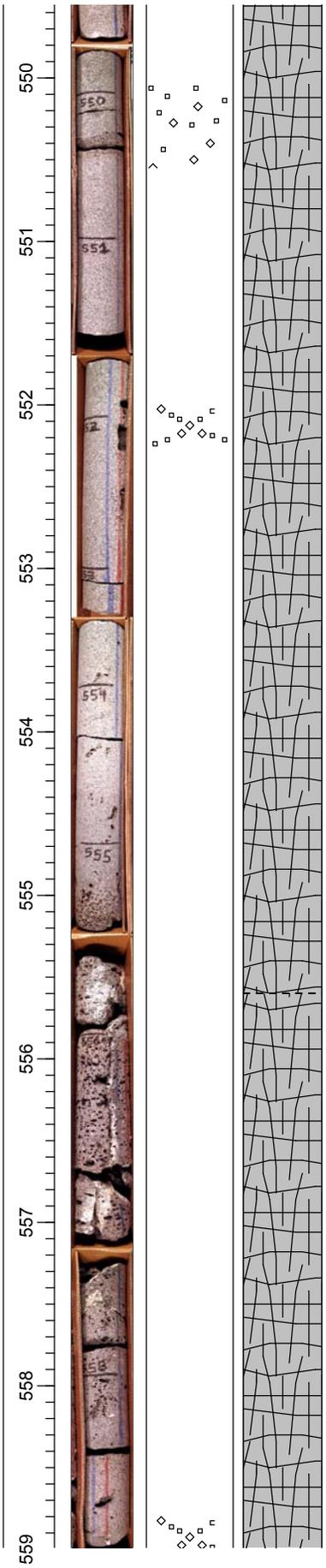




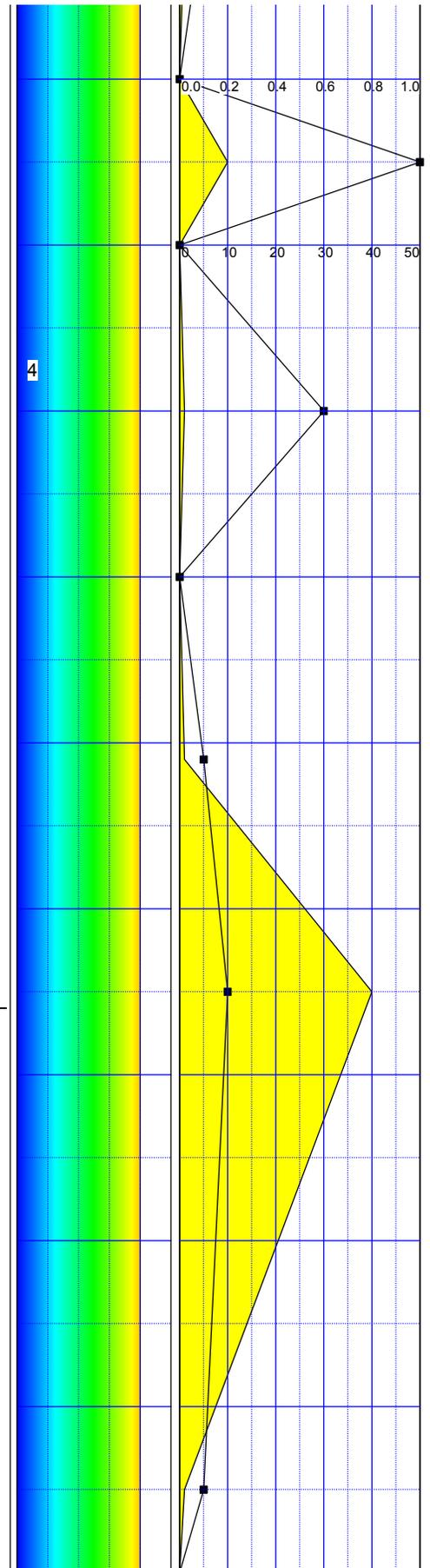


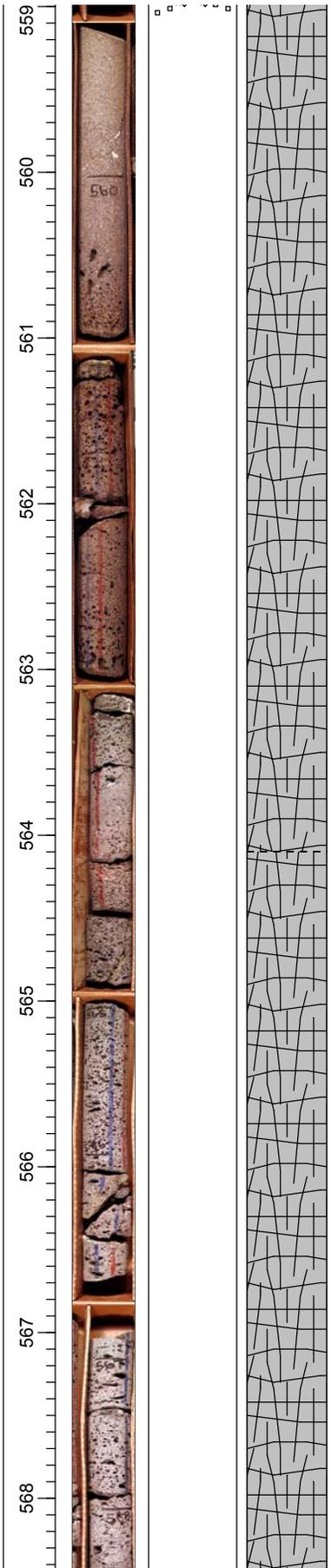
BASALT:  
COLOR: N6 Medium Dark Gray  
TEXTURE: Aphanitic, diktytaxitic, vesicular basalt; vesicular from 542.0 feet to 548.0 feet, massive from 548.0 feet to 550.5 feet, vesicular from 550.5 feet to 555.6 feet  
COMPOSITION: 50% plagioclase, 15% olivine, 45% groundmass; plagioclase is submillimeter to rare 2 millimeter laths; olivine is submillimeter to 1 millimeter euhedral to subhedral microcrysts and glomerocrysts  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 10YR 8/2 Very Pale Orange calcitic mud in fractures; very rare alteration of olivine to iddingsite



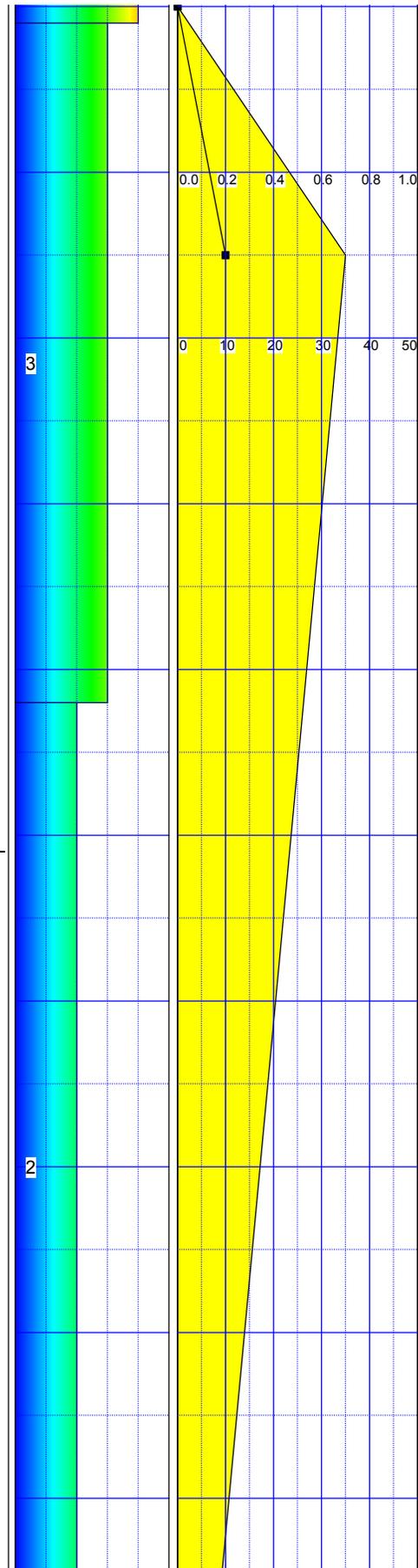


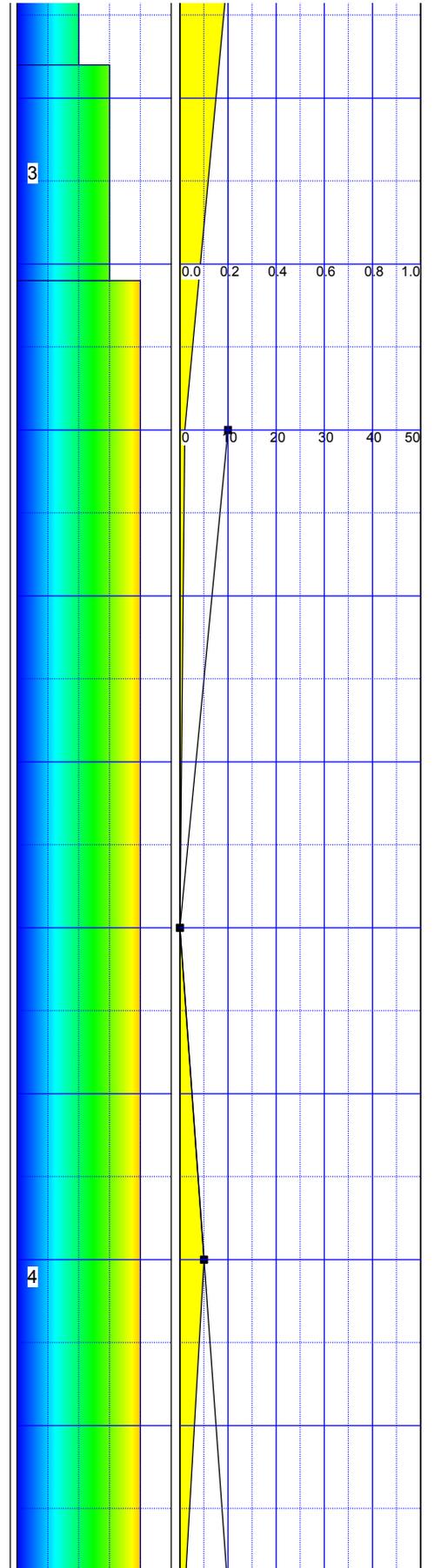
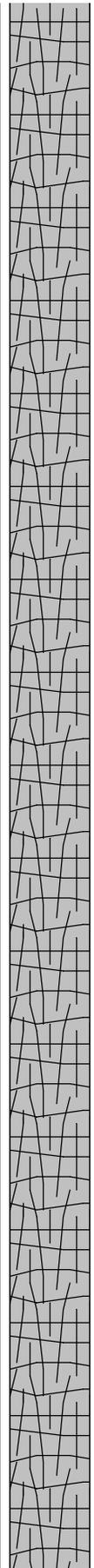
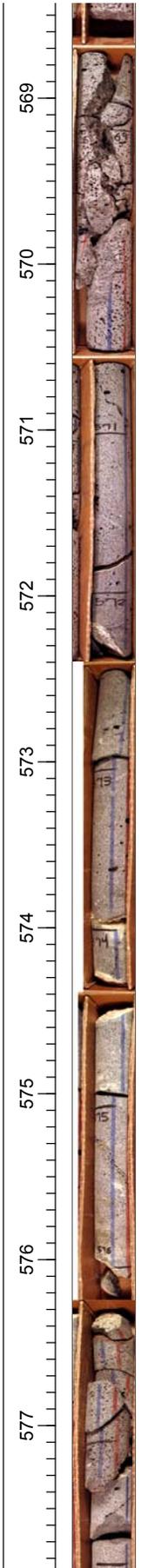
BASALT:  
 COLOR: 10YR 4/2 Grayish Red grading to 5YR 2/1 Brownish Black  
 TEXTURE: Aphanitic basalt; vesicular from 555.6 feet to 558.5 feet, massive from 558.5 feet to 560.5 feet, vesicular from 560.5 feet to 564.1 feet  
 COMPOSITION: 20% plagioclase, 5% olivine, 75% groundmass; plagioclase is submillimeter laths; olivine is submillimeter anhedral microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10YR 8/2 calcitic mud in fractures; moderate alteration to iddingsite

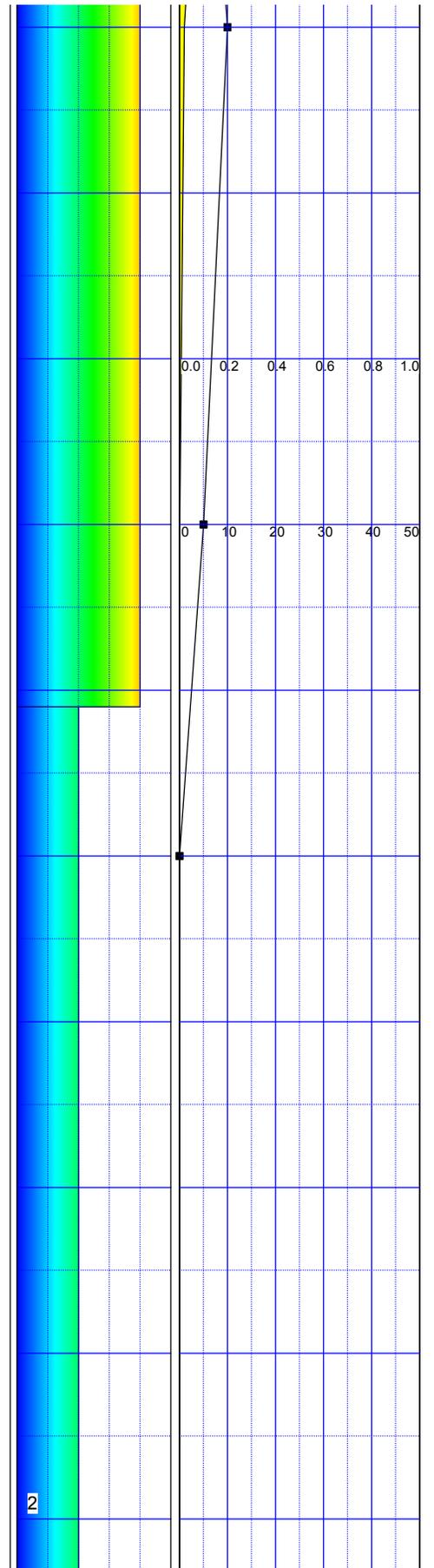
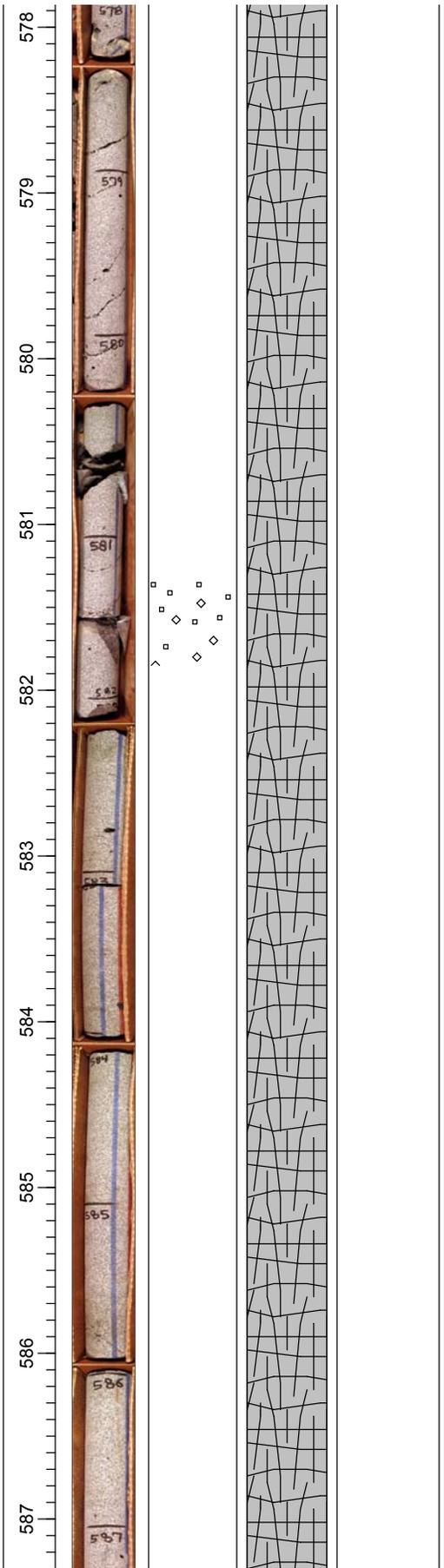


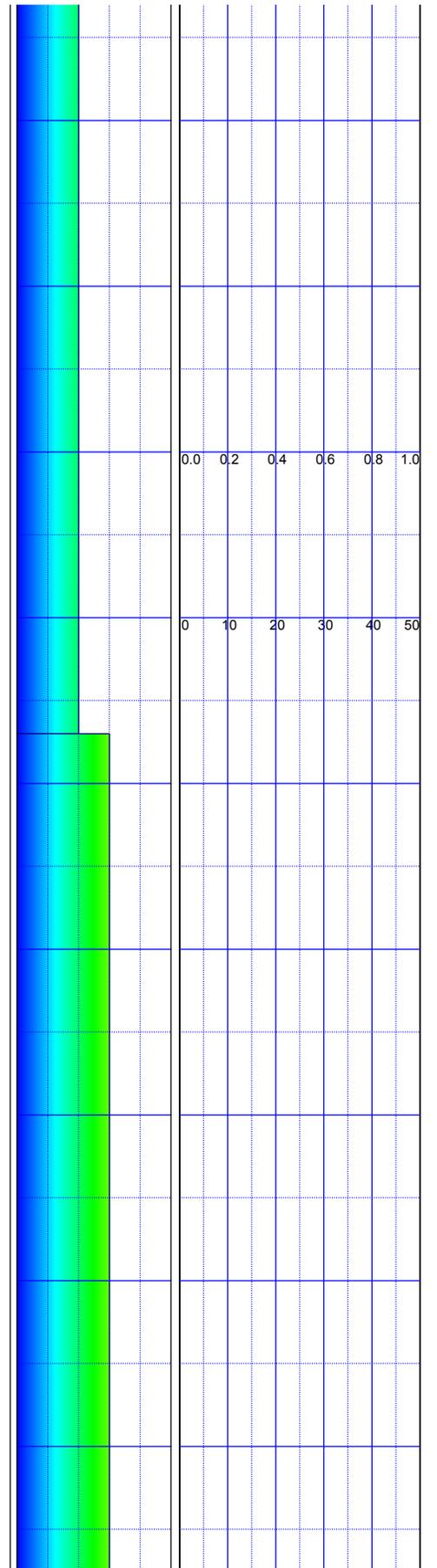
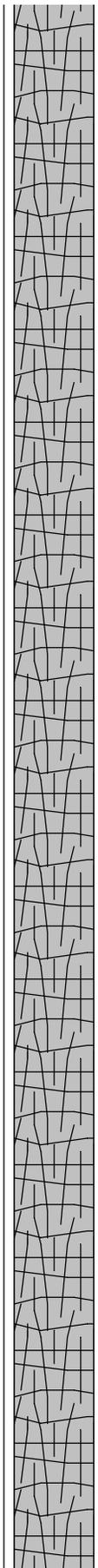
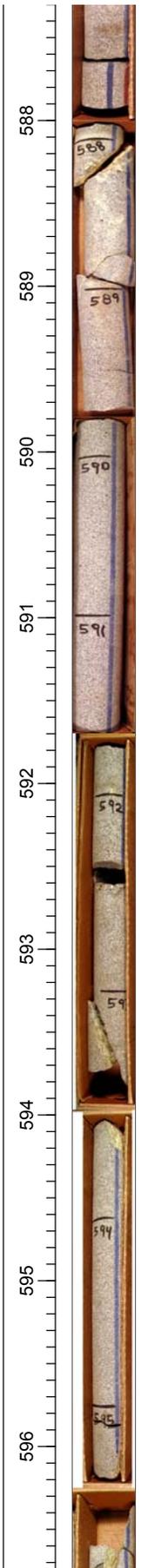


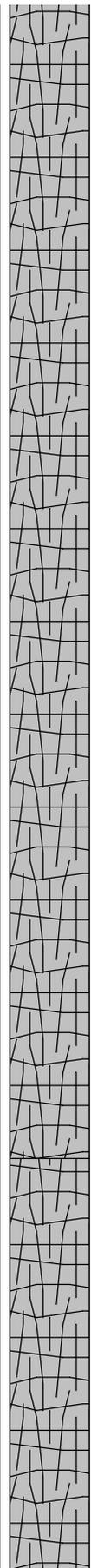
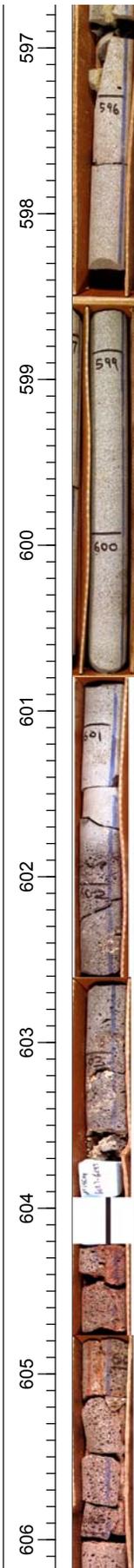
BASALT:  
COLOR: 5YR 2/1 Brownish Black  
TEXTURE: Aphanitic, diktytaxitic basalt;  
vesicular from 564.1 feet to 571.0 feet,  
massive from 571.0 feet to 601.2 feet,  
vesicular from 601.2 feet to 603.7 feet  
COMPOSITION: 65% plagioclase, 10% olivine,  
25% groundmass; plagioclase is submillimeter  
laths with rare 1 millimeter tabular  
plagioclase laths; olivine is submillimeter  
microcrysts;  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 10YR 8/2 Grayish Orange Pink  
calcite is common in fractures and vesicles



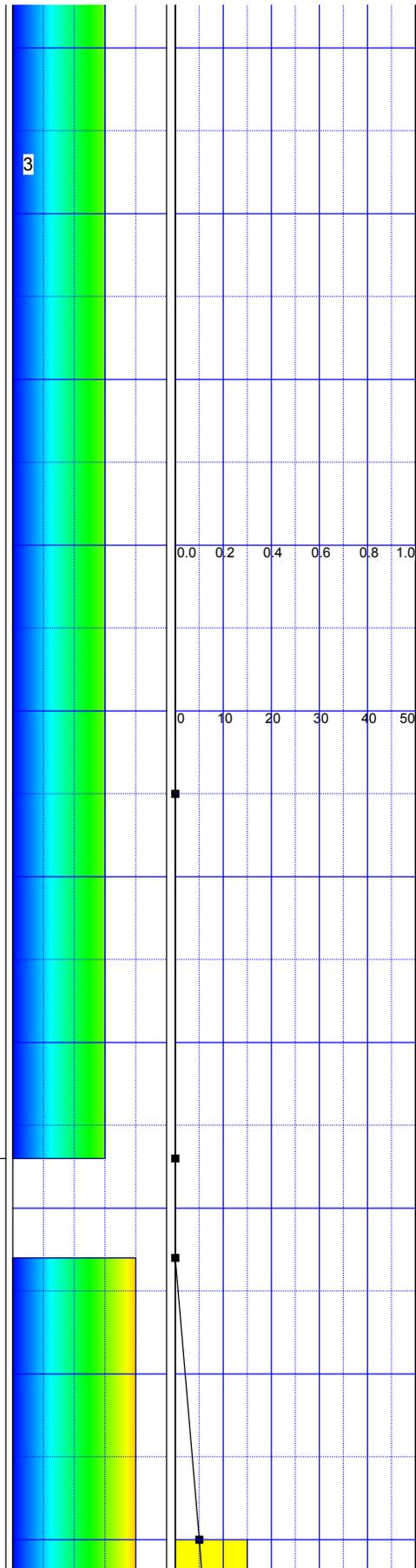


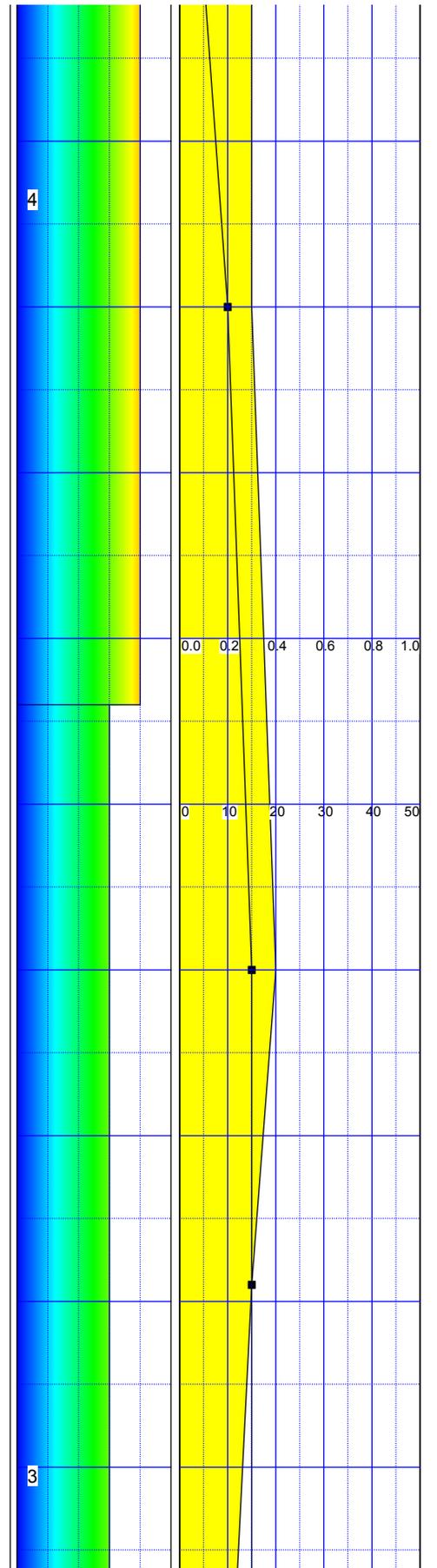
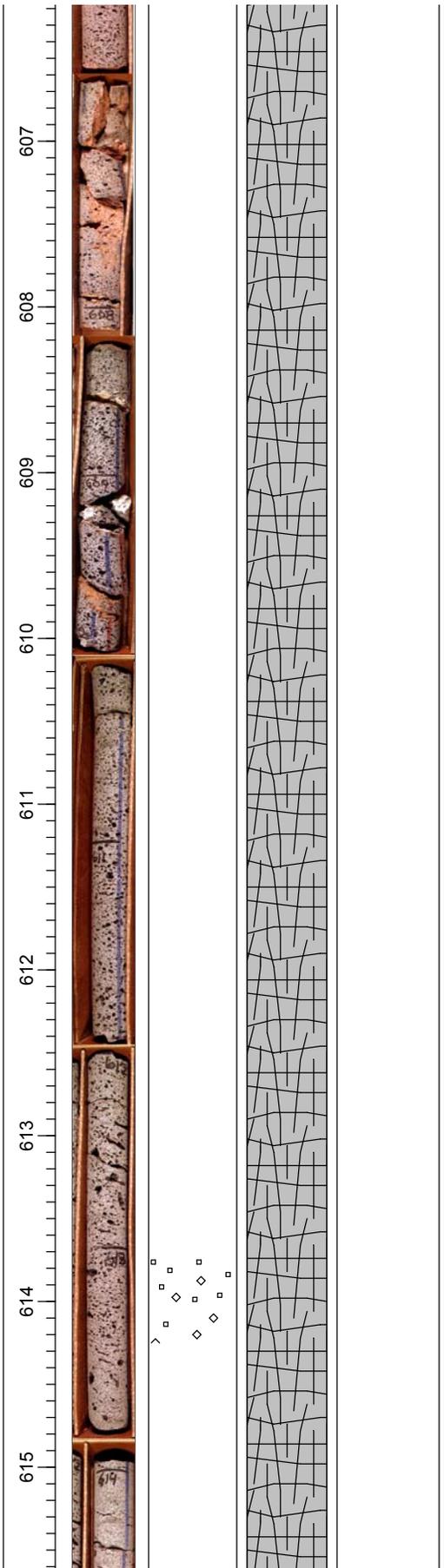


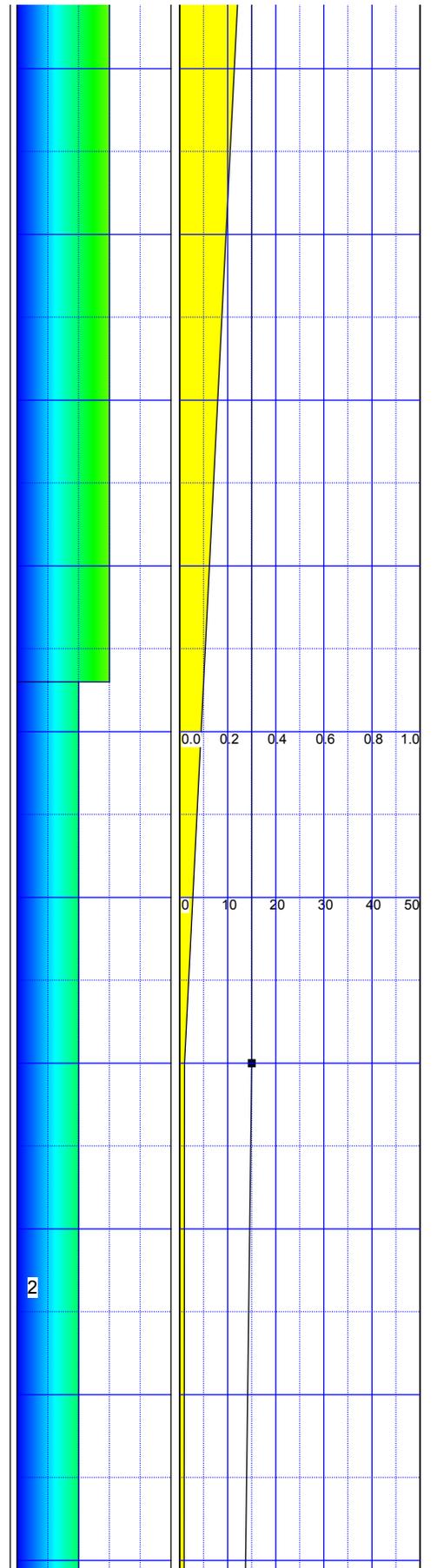
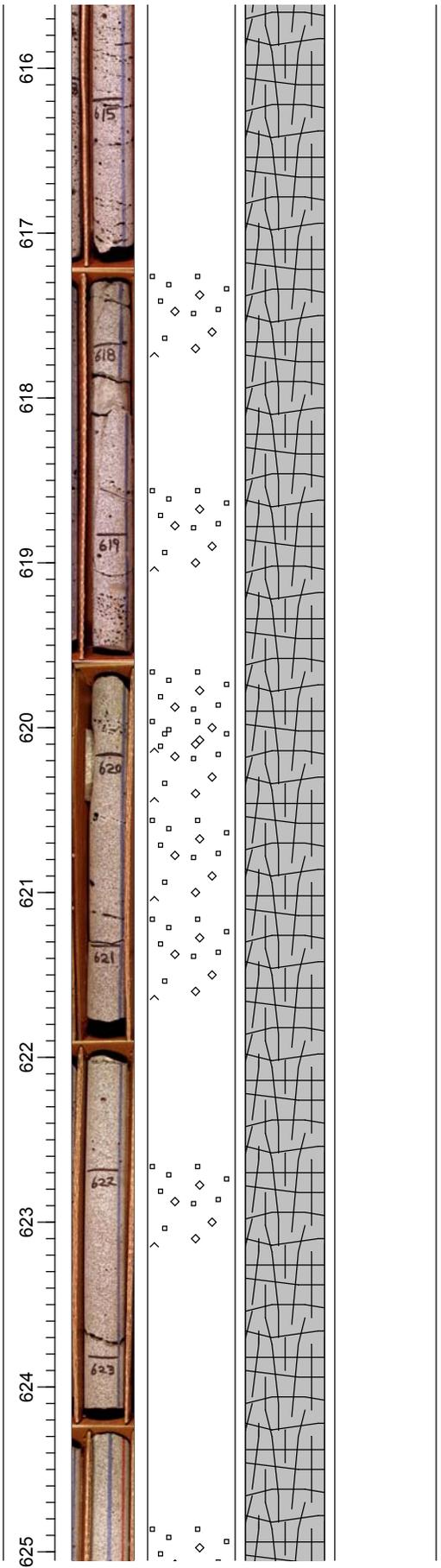


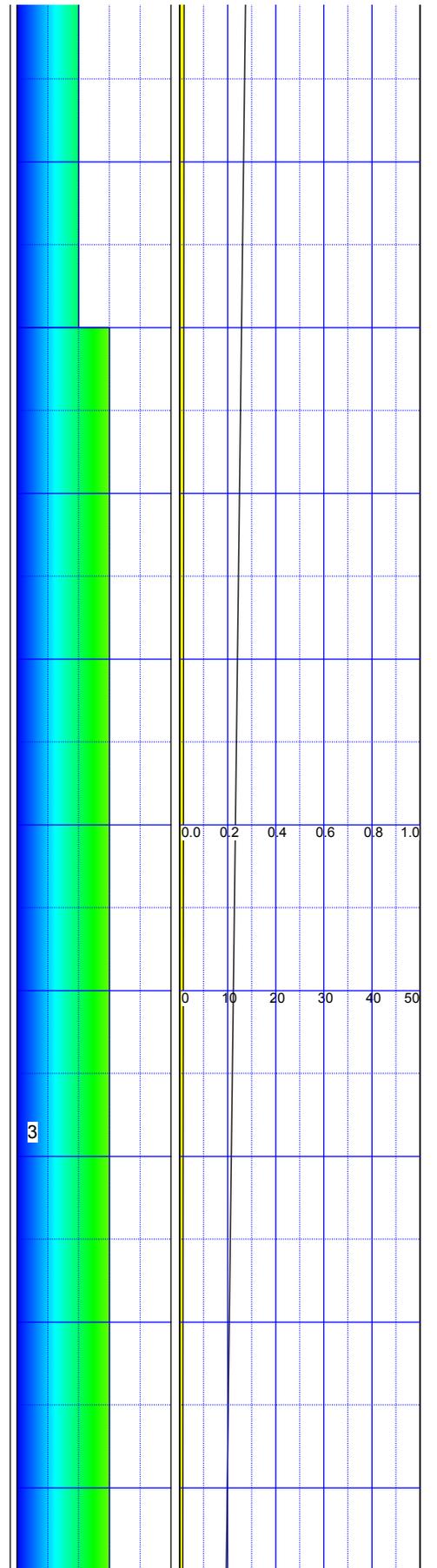
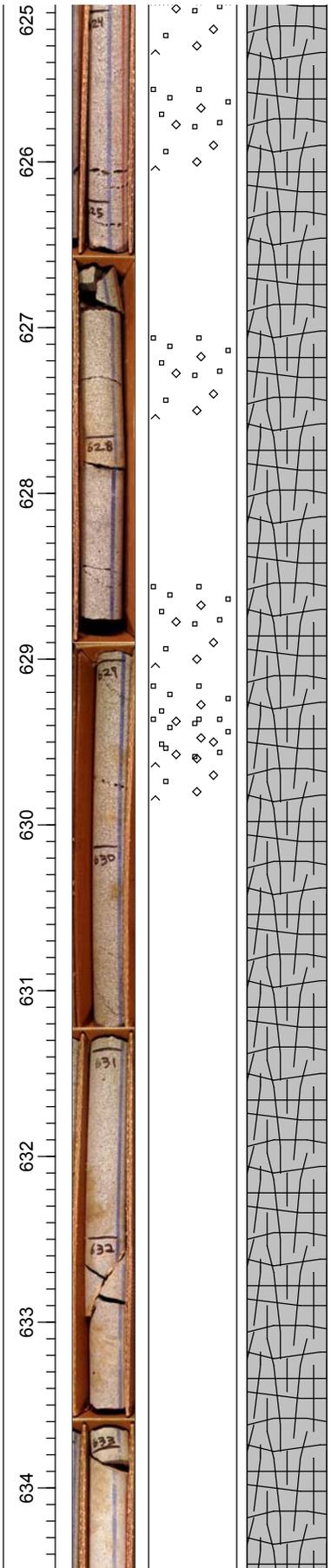


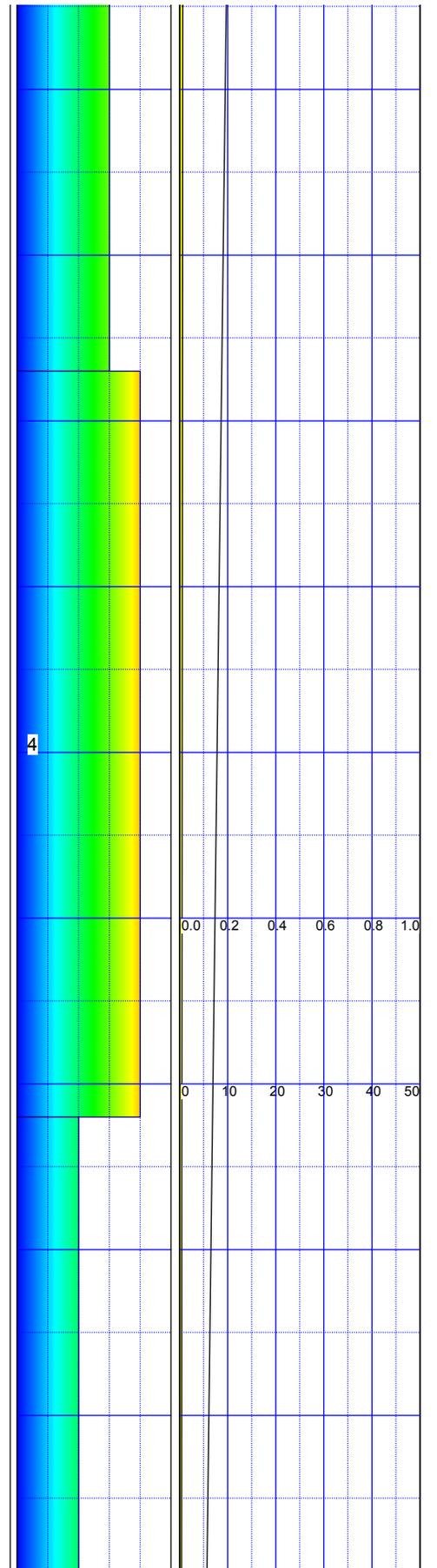
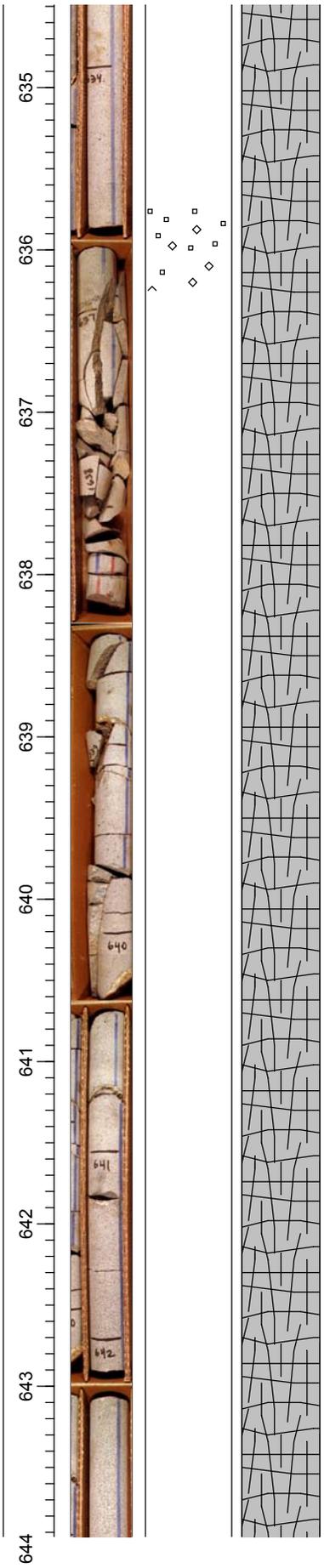
**BASALT:**  
 COLOR: 5YR 4/1 Brownish gray grading to N4 Medium Dark Gray  
 TEXTURE: Aphanitic, diktytaxitic basalt; vesicular from 603.7 feet to 614.0 feet, massive from 614.0 feet to 642.1 feet, vesicular from 642.1 feet to 651.9 feet, massive from 651.9 feet to 655.0 feet, vesicular from 655.0 feet to 657.3 feet, flow and mold structure at base  
 COMPOSITION: 45% plagioclase, 30% olivine, 25% groundmass; plagioclase is submillimeter laths with rare submillimeter to 1 millimeter tabular laths; olivine is submillimeter anhedral microcrysts with rare 1 to 2 millimeter glomerocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 10R 7/4 Moderate Orange Pink non-calcitic mud in fractures near top; N8 Very Light Gray non-calcitic mud found in fractures throughout this interval

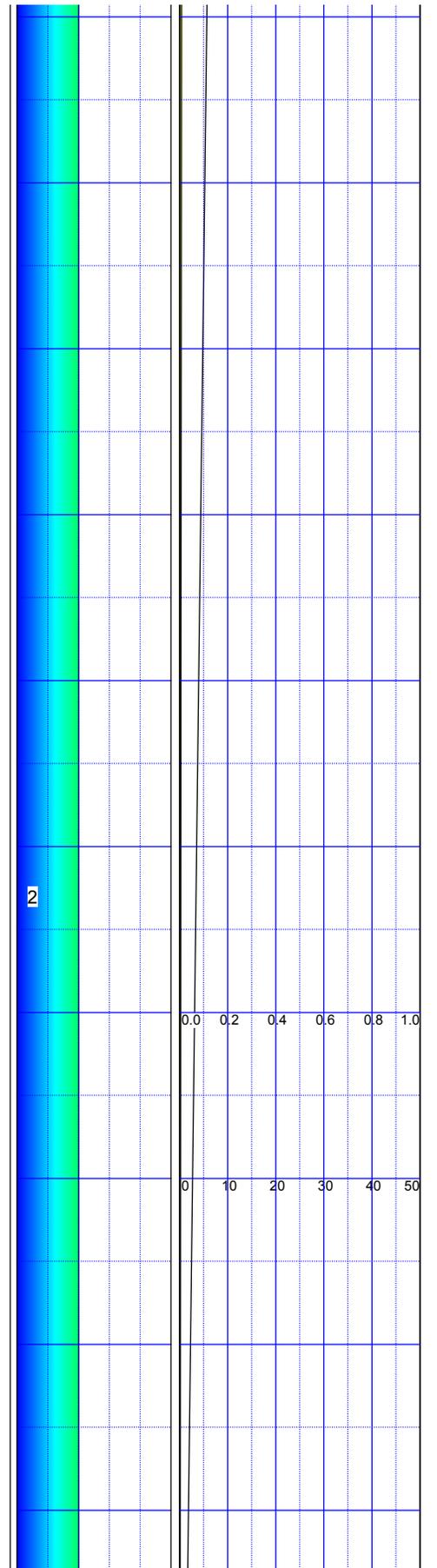
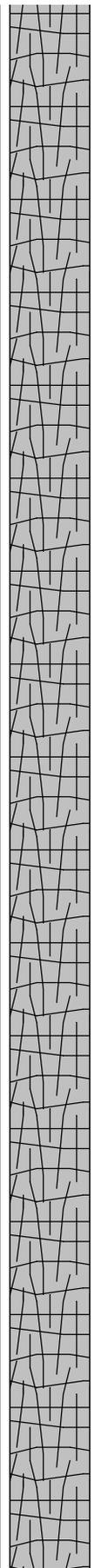
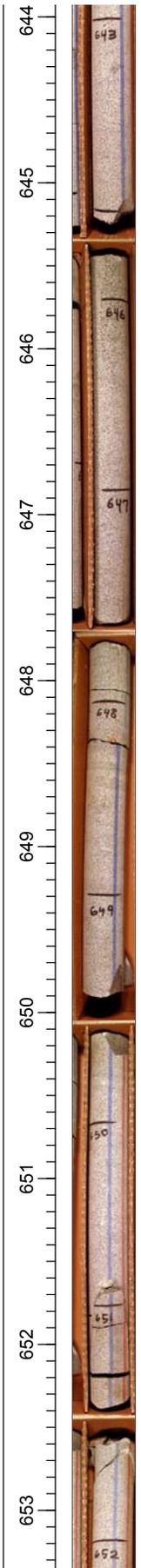


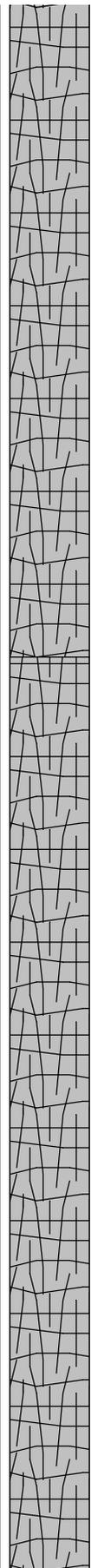
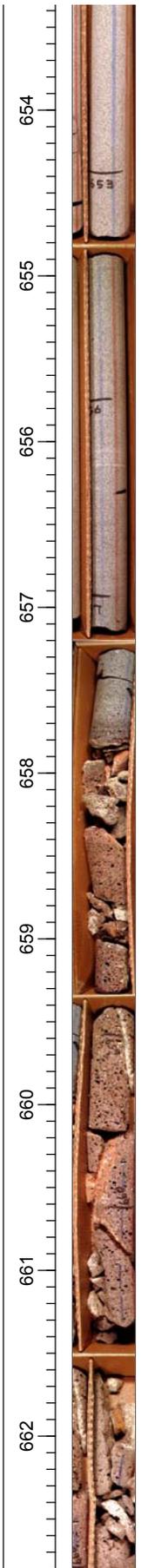




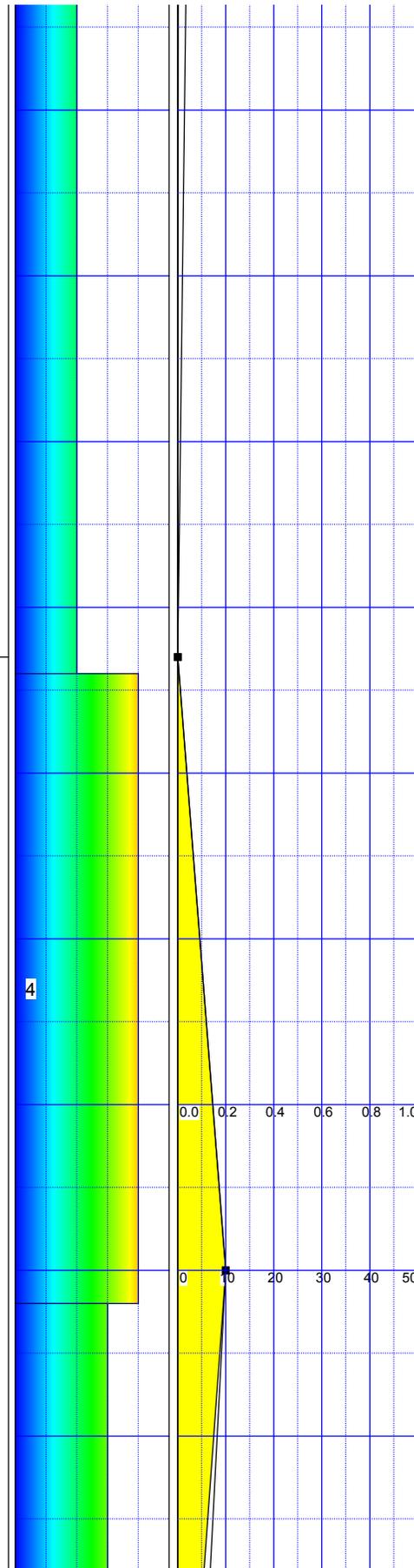


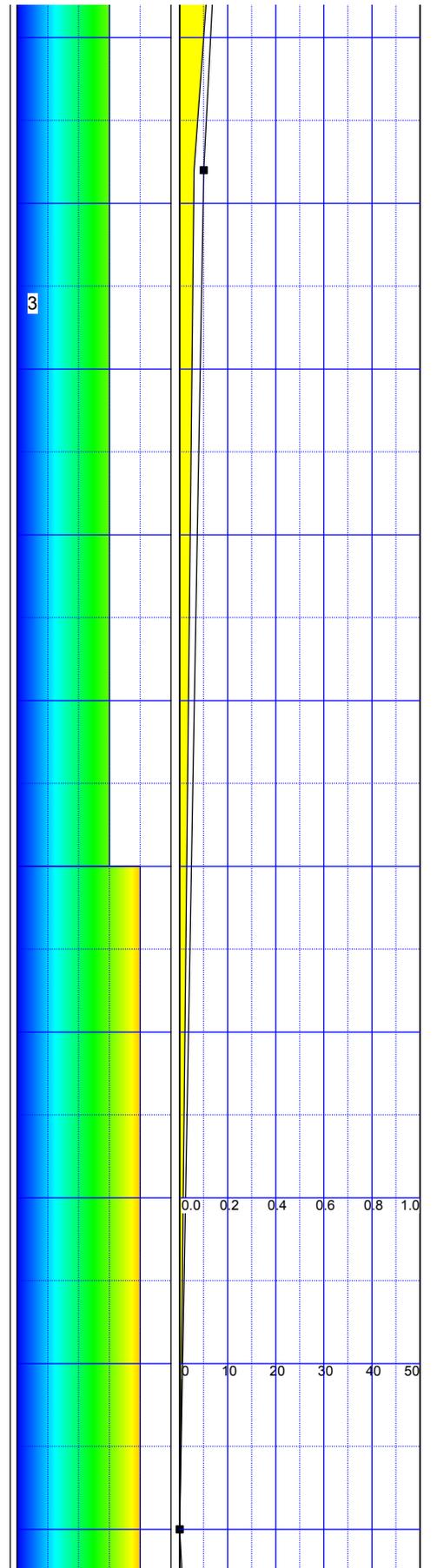
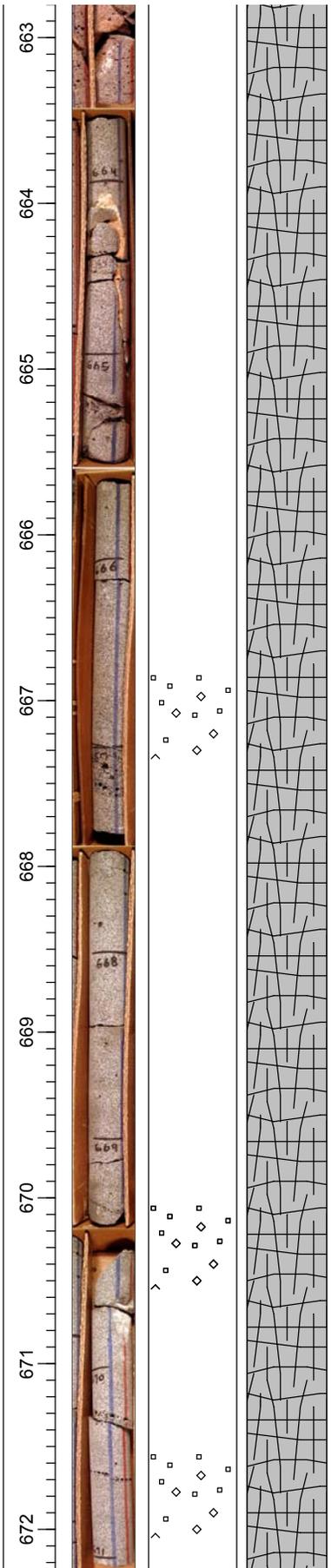


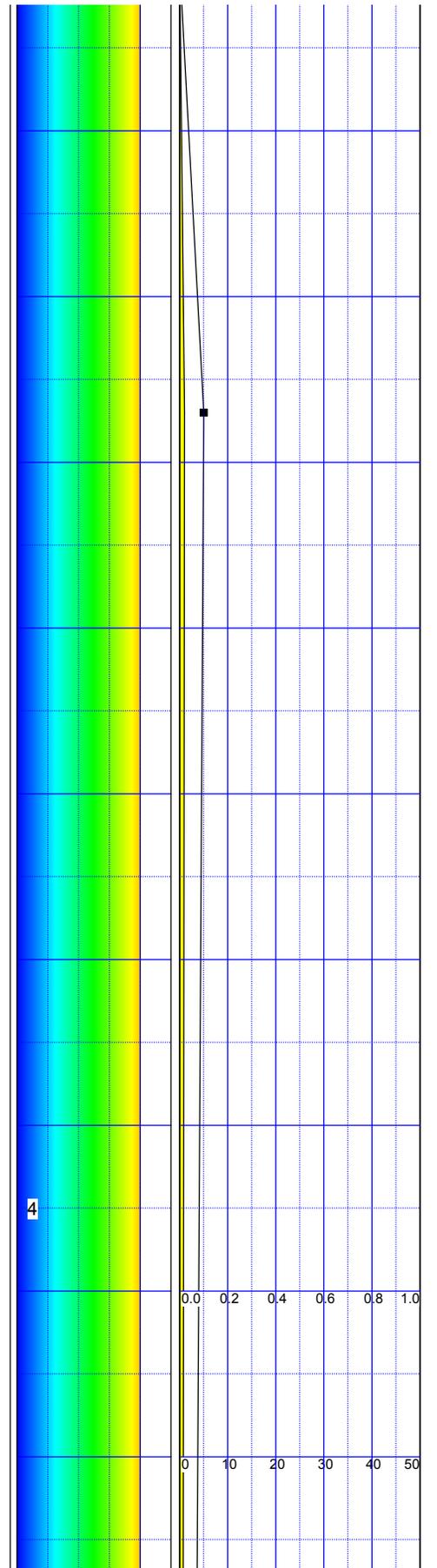
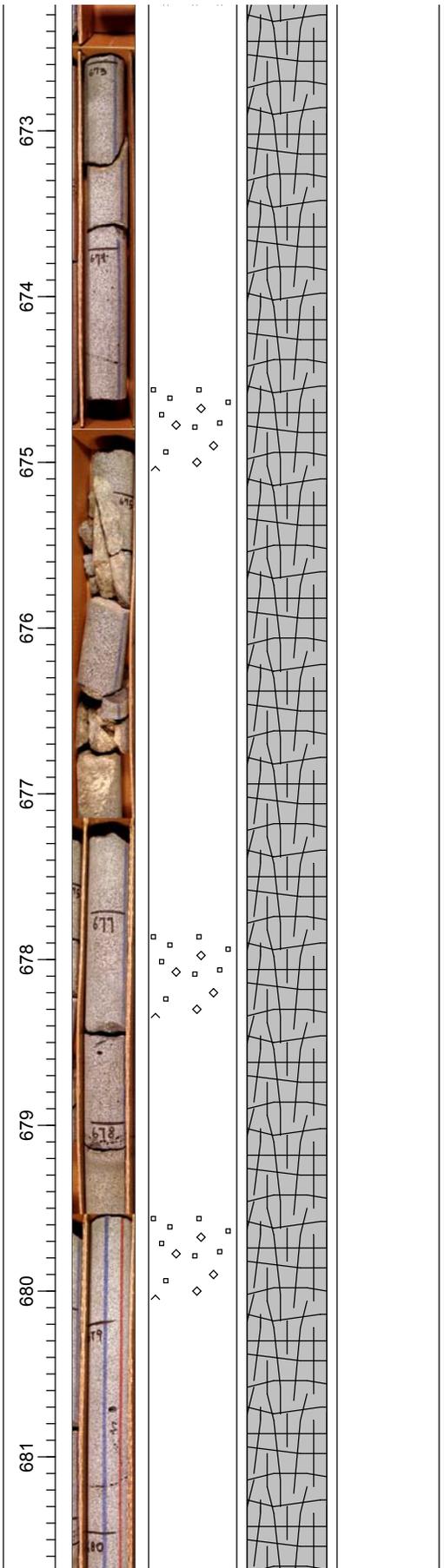


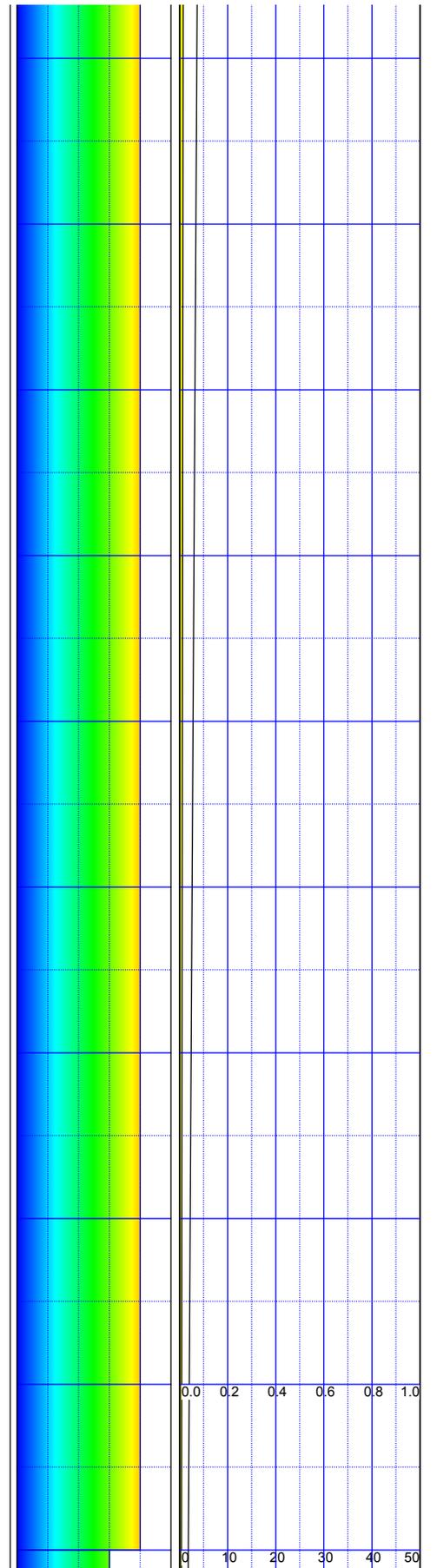
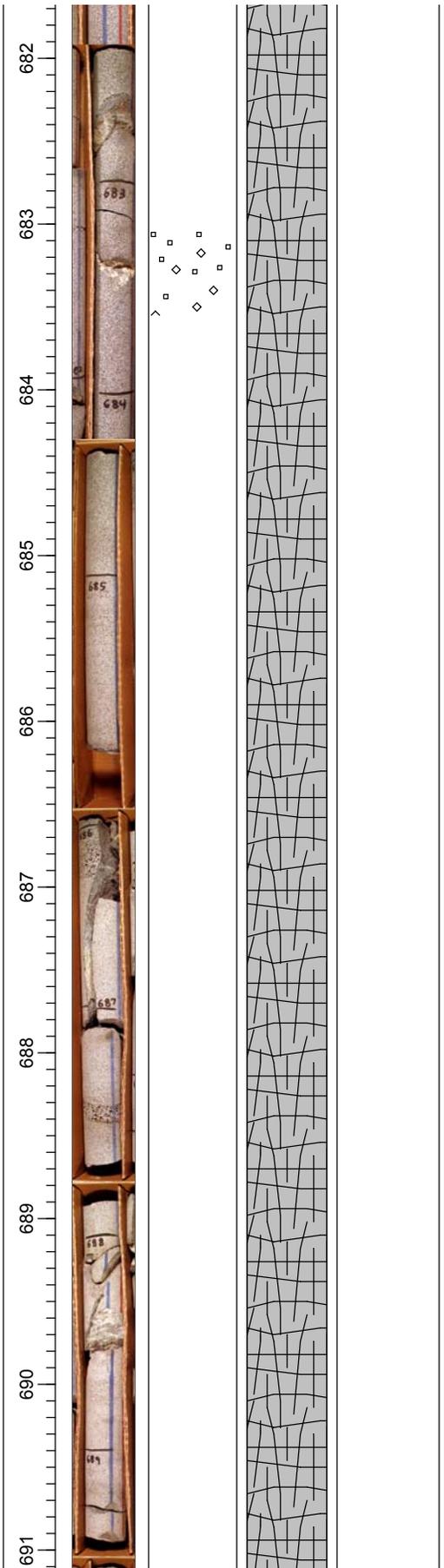


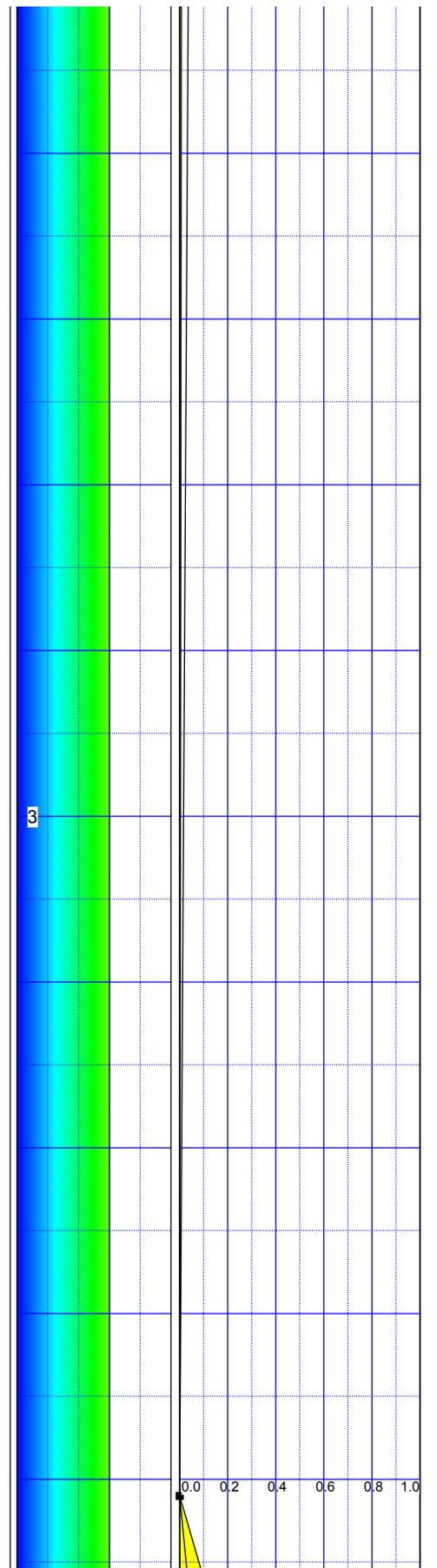
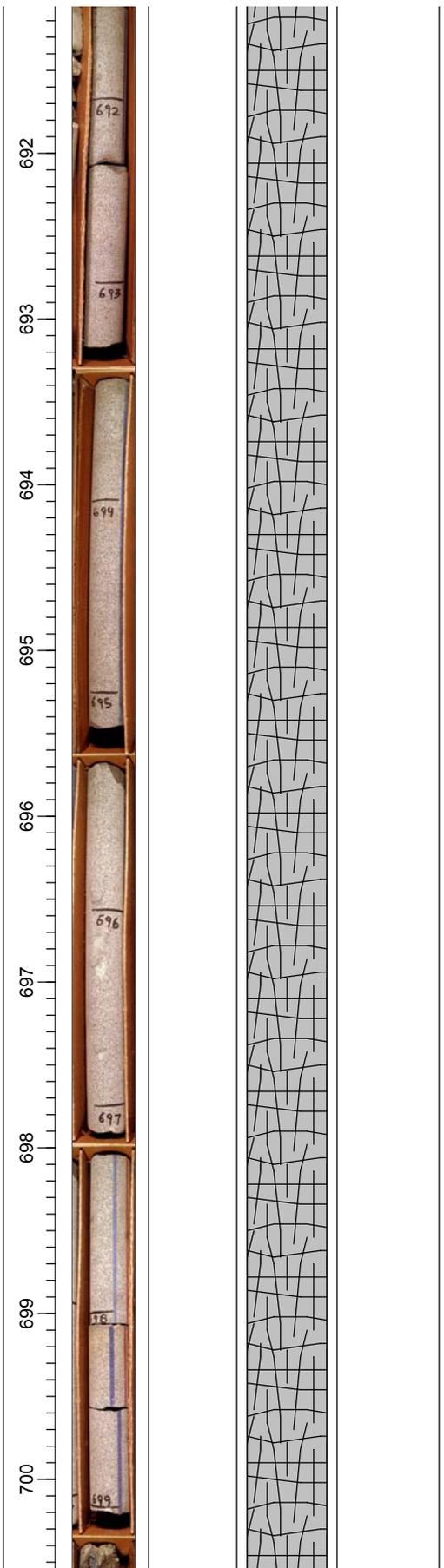
BASALT:  
COLOR: 5R 4/2 Grayish Red grading to N4  
Medium Dark Gray  
TEXTURE: Aphanitic, basalt; vesicular from 657.3 feet to 685.0 feet, massive from 685.0 feet to 690.0 feet, vesicular from 690.0 feet to 700.9 feet, flow and mold structure at base  
COMPOSITION: 45% plagioclase, 15% olivine, 3% pyroxene, 37% groundmass. Plagioclase is mostly submillimeter to 1 millimeter tabular laths, olivine is submillimeter to 1 millimeter anhedral microcrysts with rare 1 millimeter glomerocrysts; submillimeter to 1 millimeter anhedral pyroxenes are most common with rare submillimeter to 1 millimeter acicular blades  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 10YR 8/2 slightly calcitic mud in fractures near top with 5YR 5/6 Light Brown non-calcitic mud in fractures and rare vesicles near the middle of this interval

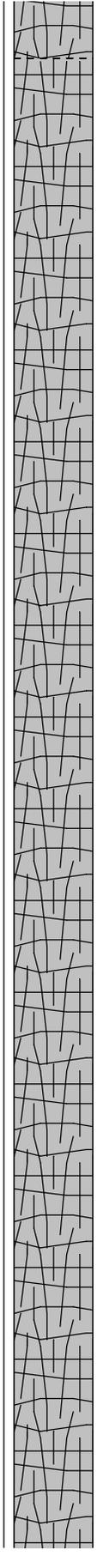






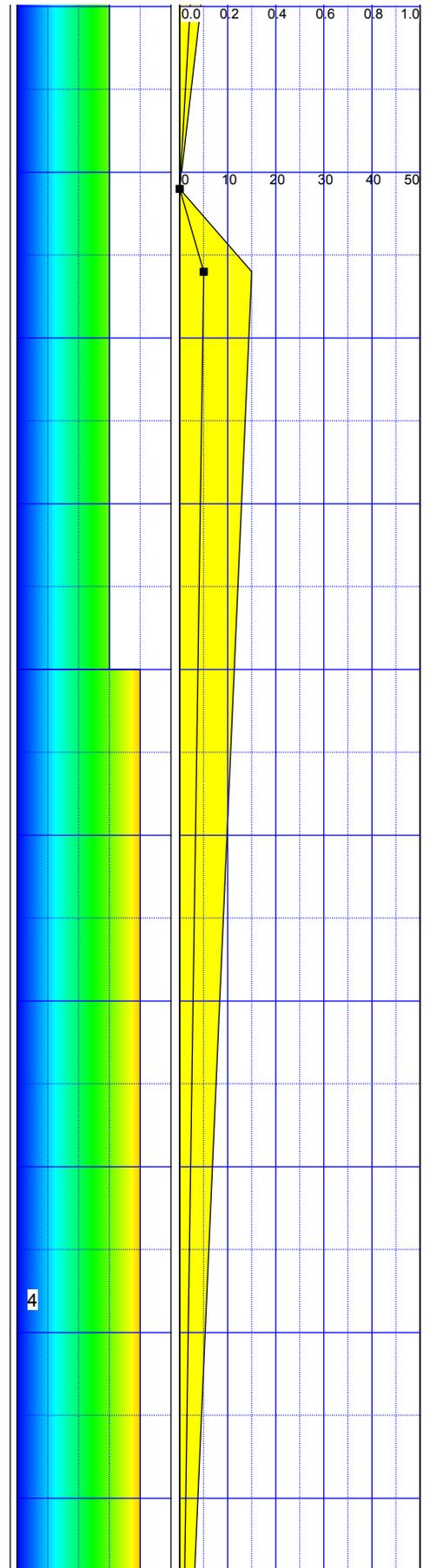
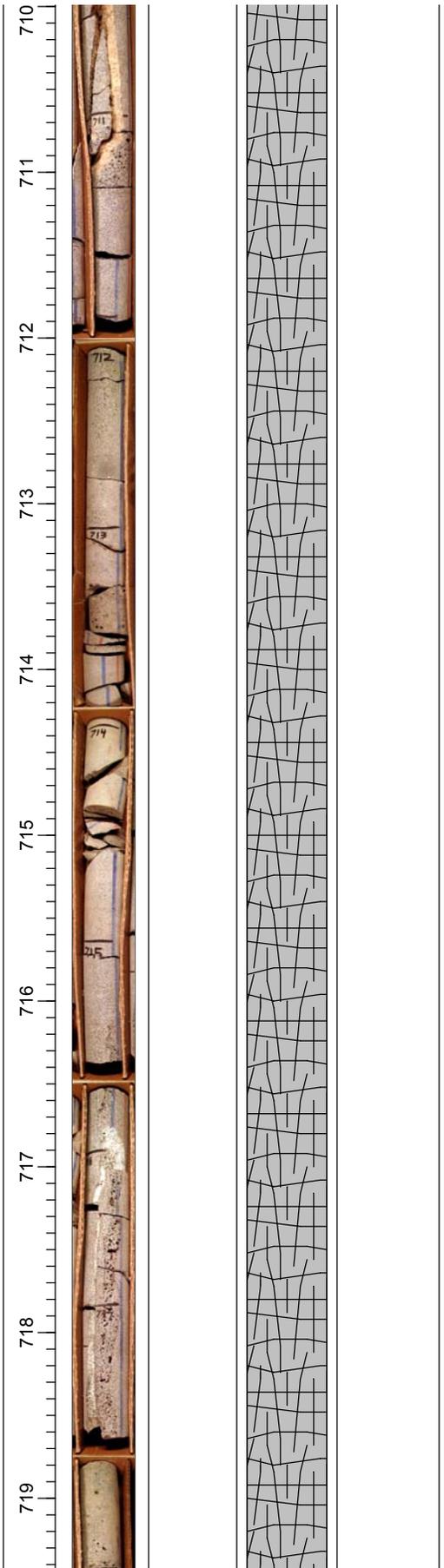


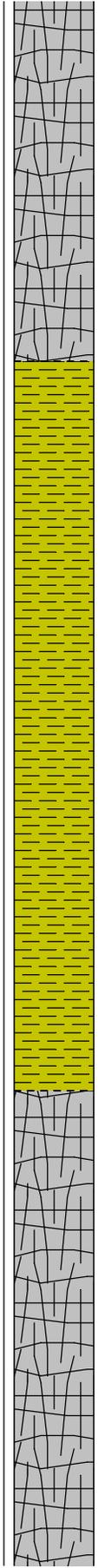
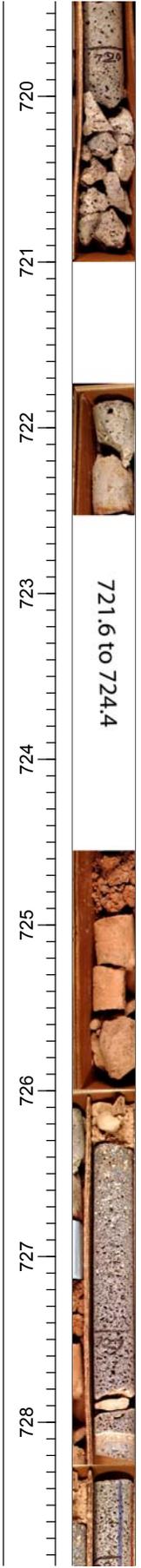




BASALT:  
COLOR: 5YR 4/2 Grayish Red grading to N4  
Medium Dark Gray  
TEXTURE: Aphanitic, vesicular basalt;  
vesicular from 700.9 feet to 711.3 feet,  
massive from 711.3 feet to 721.6 feet  
COMPOSITION: 40% plagioclase, 25% olivine,  
5% pyroxene, and 40% groundmass.  
Plagioclase is submillimeter tabular laths;  
olivine is mostly anhedral to subhedral  
submillimeter microcrysts; submillimeter  
anhedral pyroxenes  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 10R 6/6 Moderate Reddish Orange  
mud found near top, 10YR 8/2 Very Pale  
Orange mud found in fractures. Heavy  
alteration is found, with the majority of  
the alteration being olivine to iddingsite  
with very bright red alteration rims being  
found

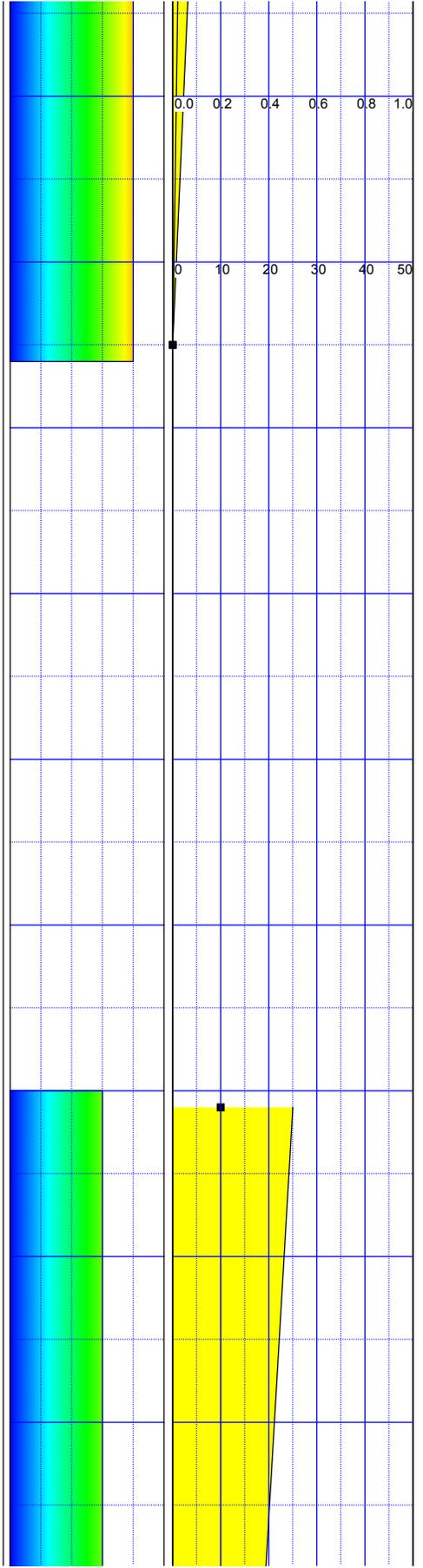


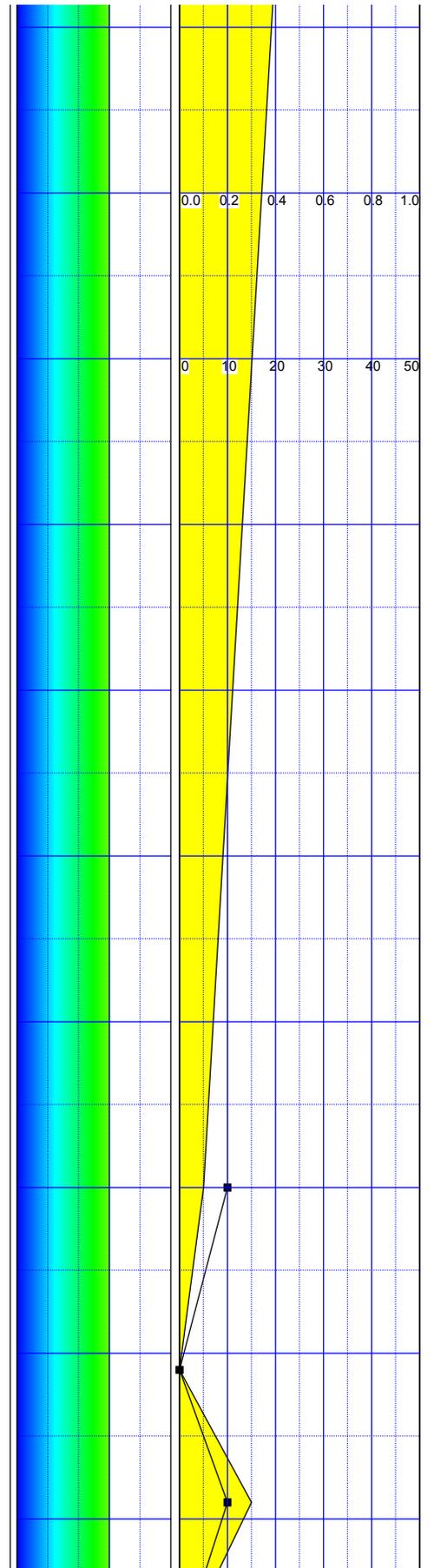
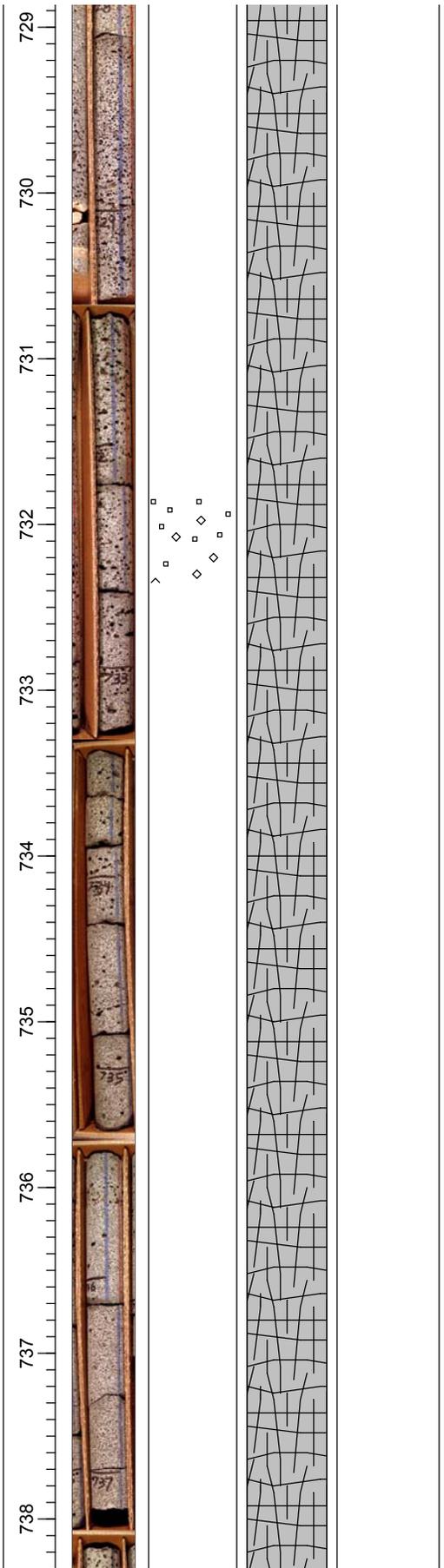


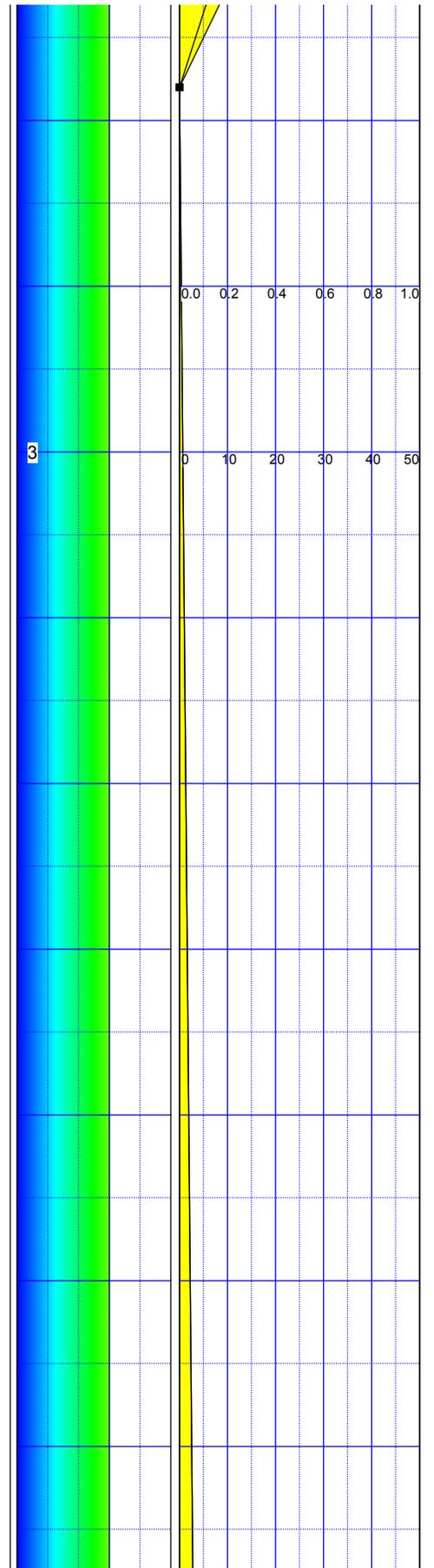
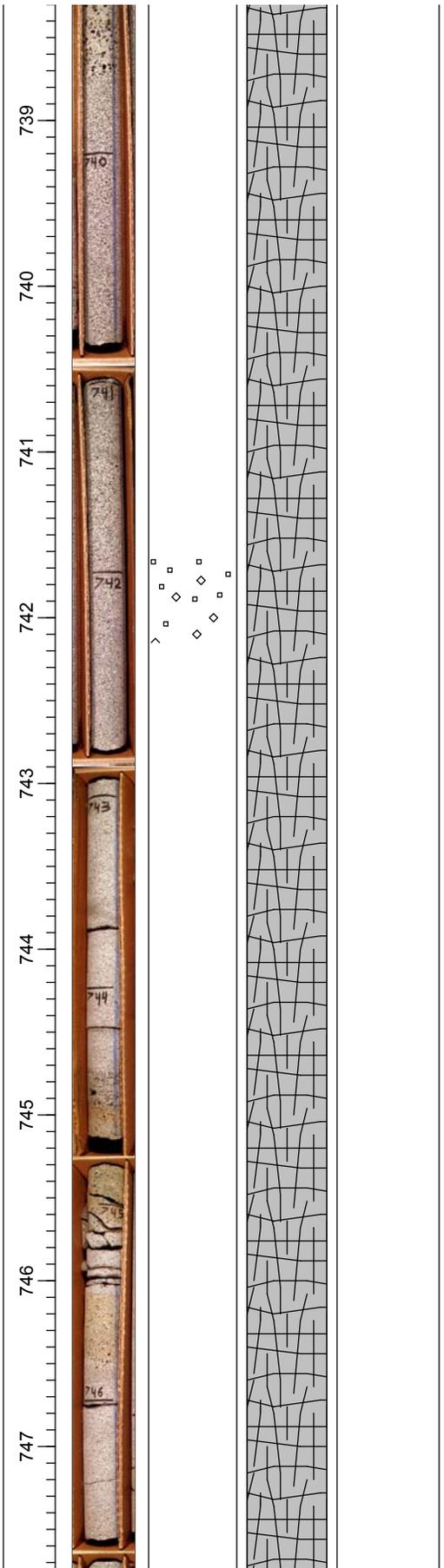


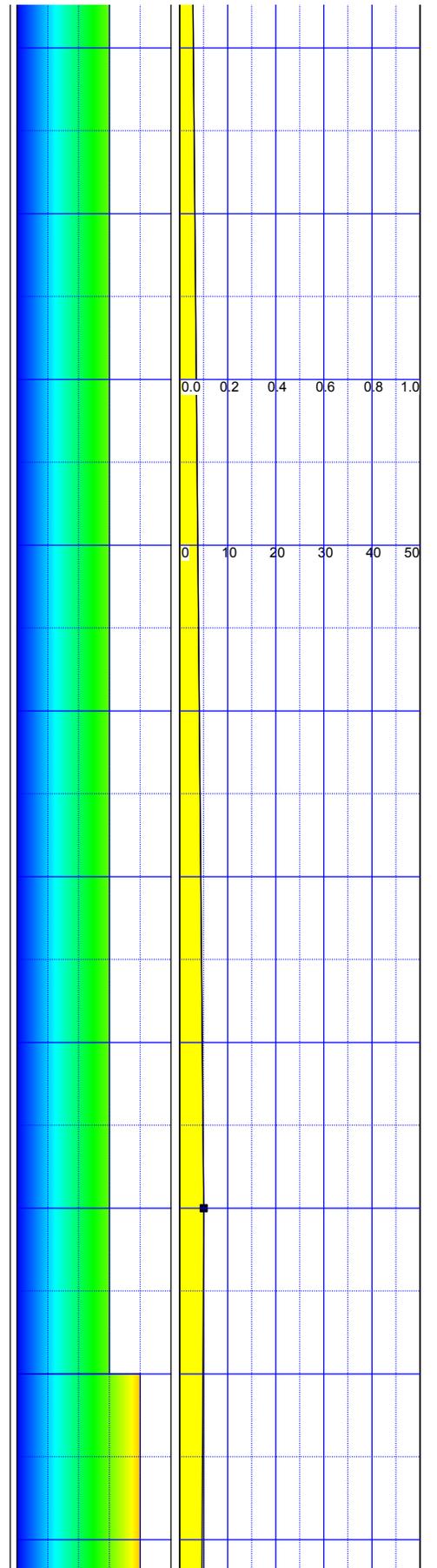
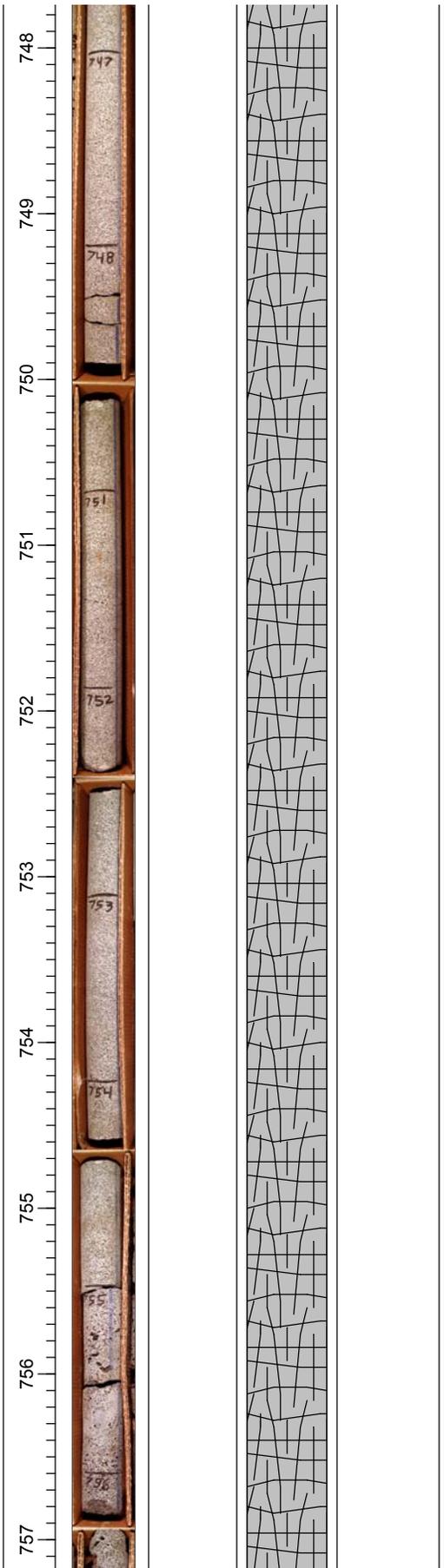
SILT AND CLAY:  
 COLOR: 10YR 5/6 Light Brown  
 TEXTURE: Silt with fines, USCS  
 Classification Silt, grains are angular to subrounded  
 STRUCTURE: Structureless, massive  
 CONSISTENCY: Firm  
 CARBONATES: Slightly calcitic  
 ROCKS: None noted  
 ROOTS/FOSSILS: None noted

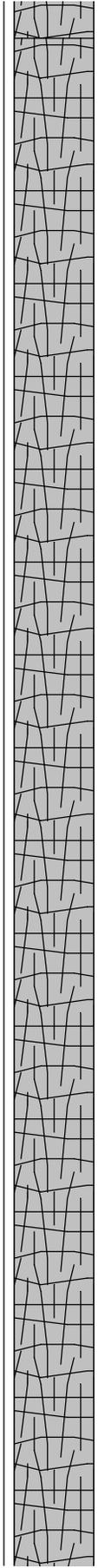
BASALT:  
 COLOR: N4 Medium Gray  
 TEXTURE: Aphanitic, basalt; vesicular from 726.0 feet to 734.0 feet, massive from 734.0 feet to 755.0 feet, vesicular from 755.0 feet to 757.4 feet, rubbly zone at base  
 COMPOSITION: 60% plagioclase, 20% olivine, 5% pyroxene, 15% groundmass; plagioclase is submillimeter to 1 millimeter tabular laths, olivine is submillimeter to 1 millimeter anhedral microcrysts with rare 2 millimeter glomerocrysts, pyroxenes are 1 millimeter subhedral microphenocrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: 5YR 5/2 calcitic mud in fractures, slight alteration to iddingsite throughout, heavy alteration to iddingsite at base



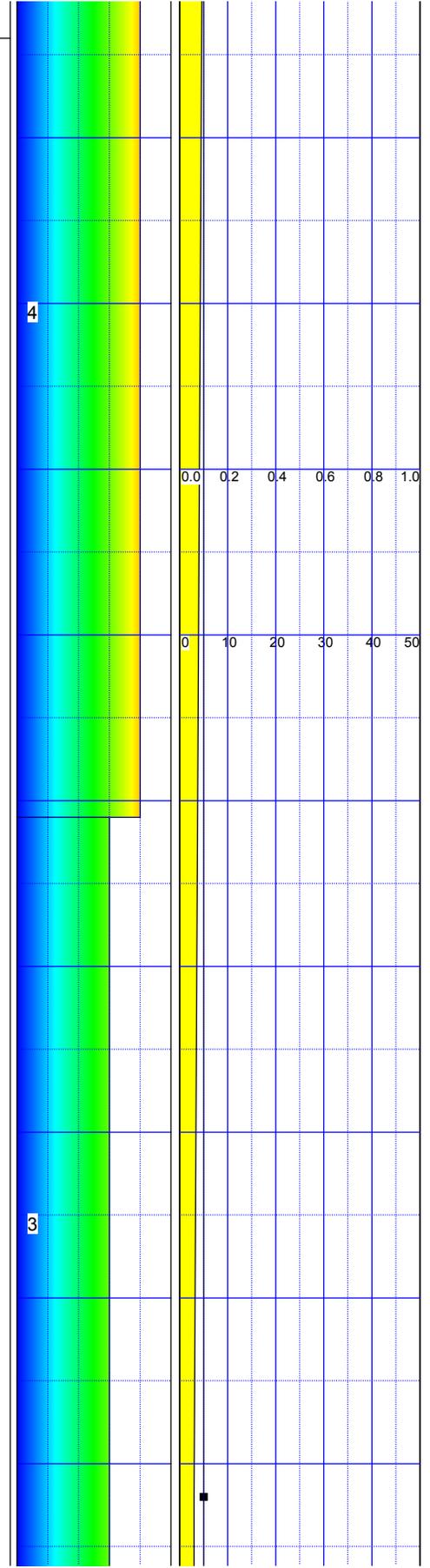


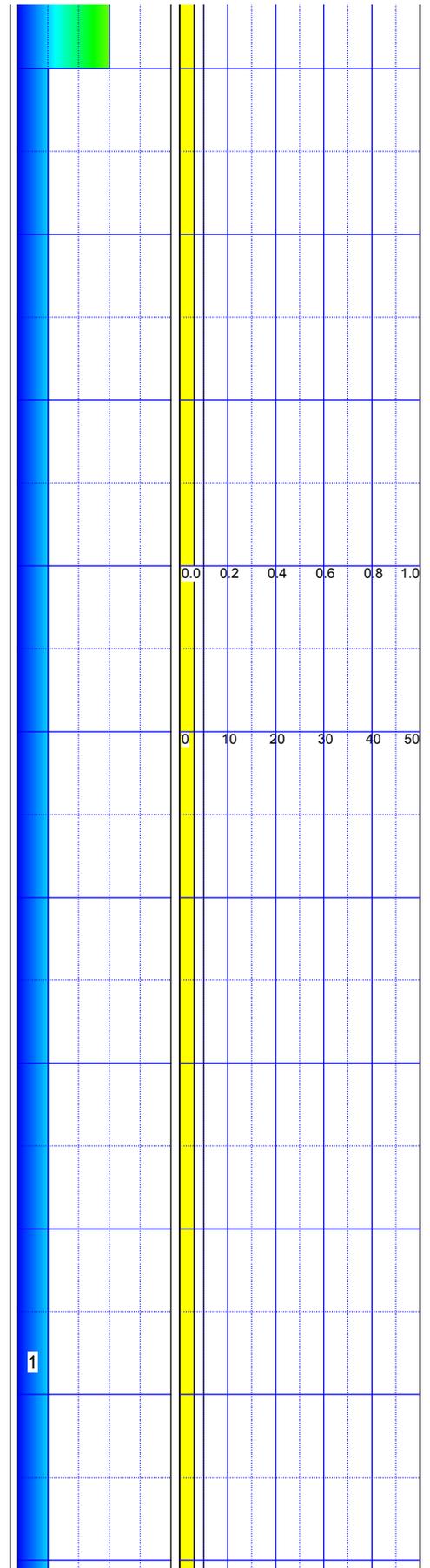
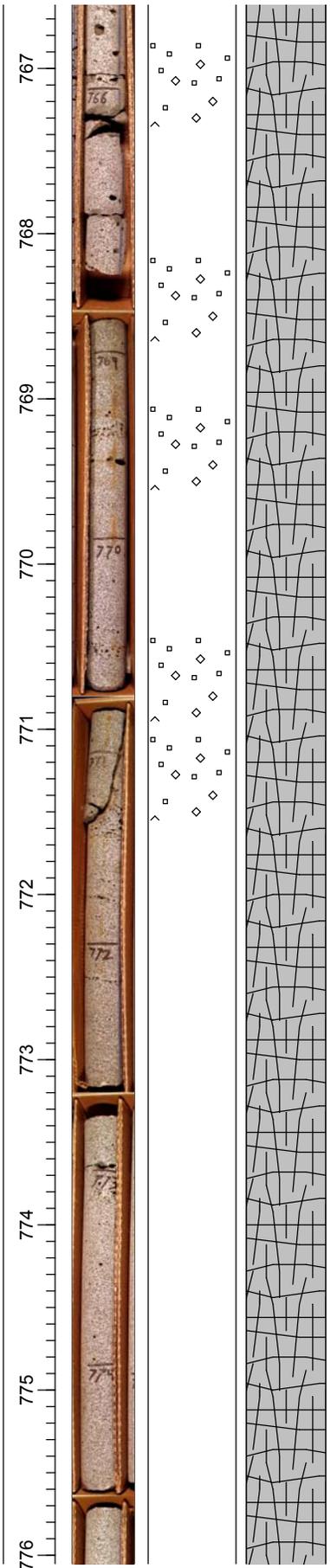


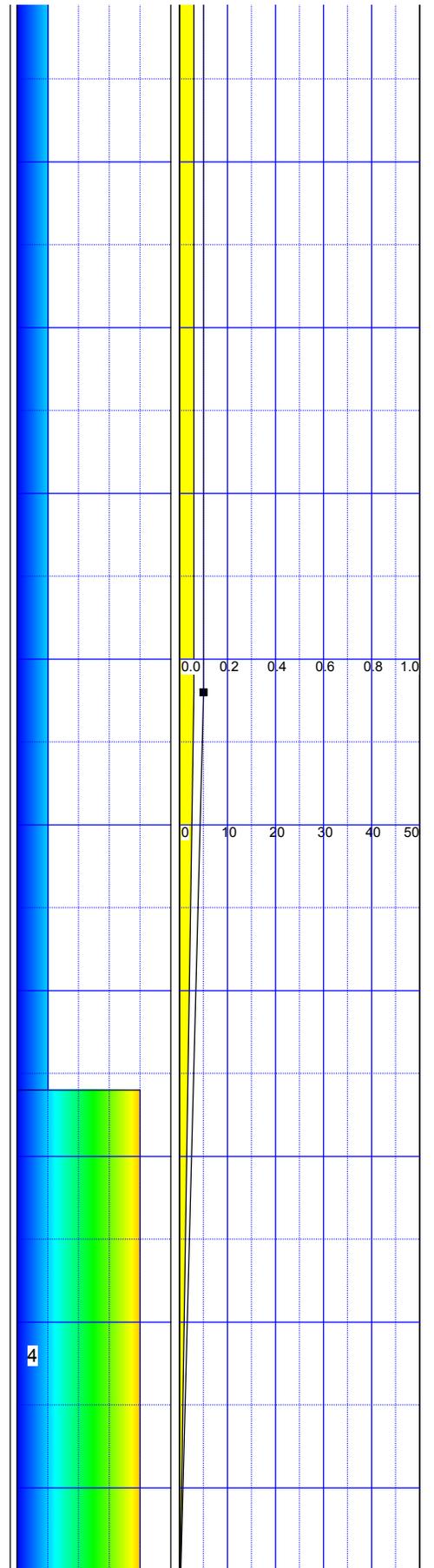
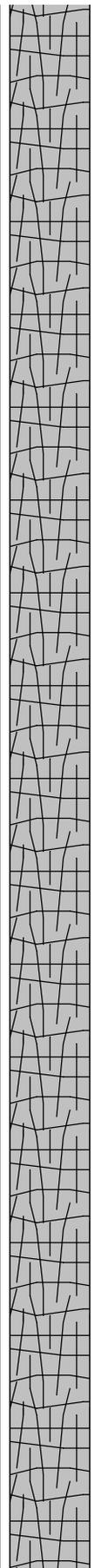
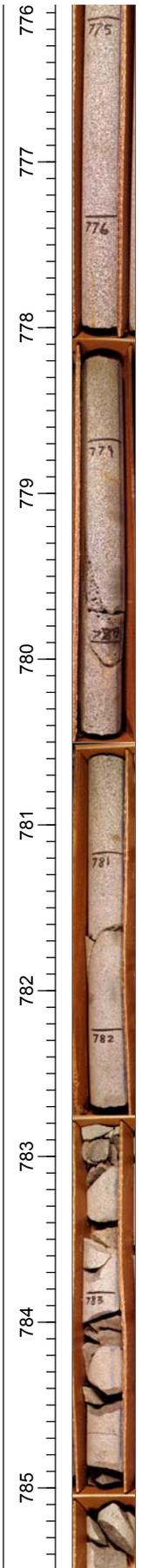


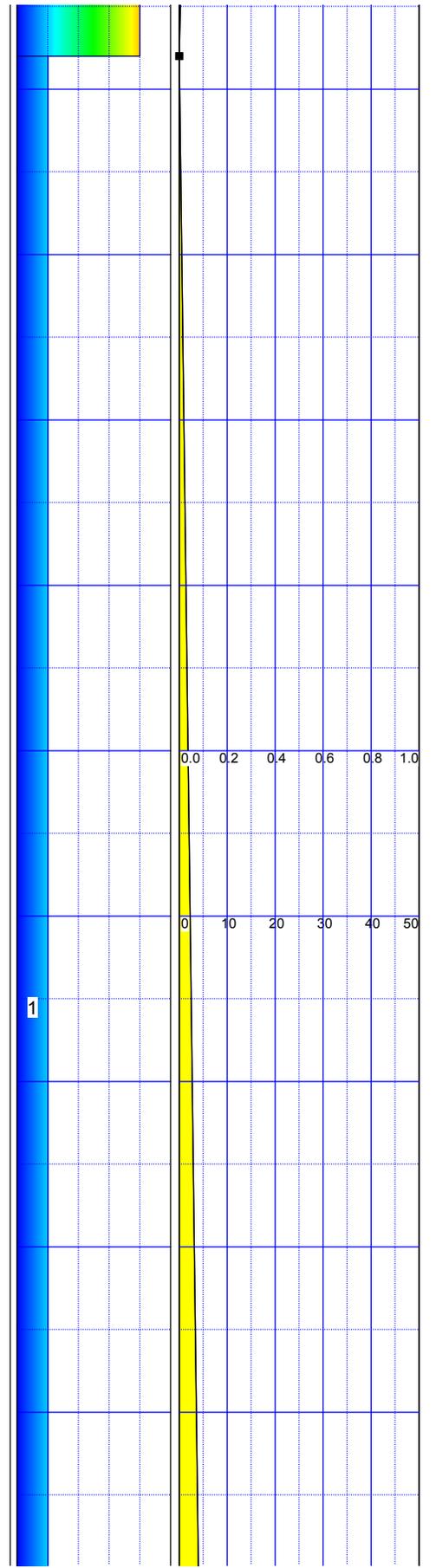
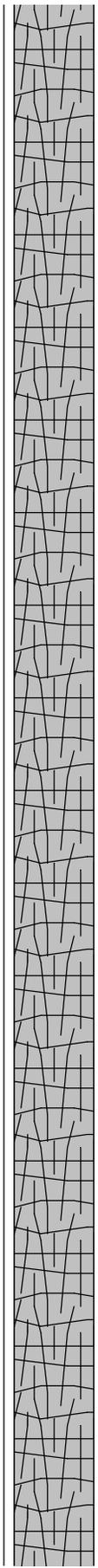
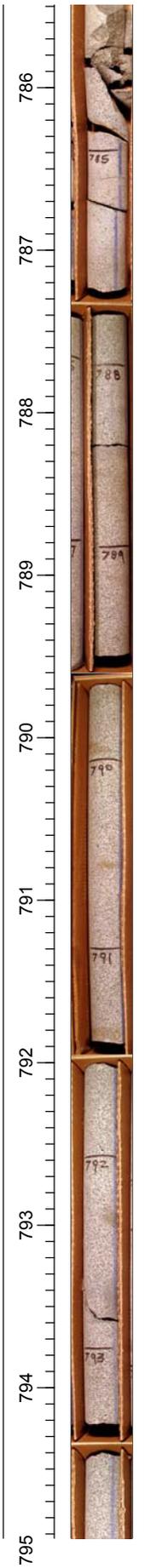


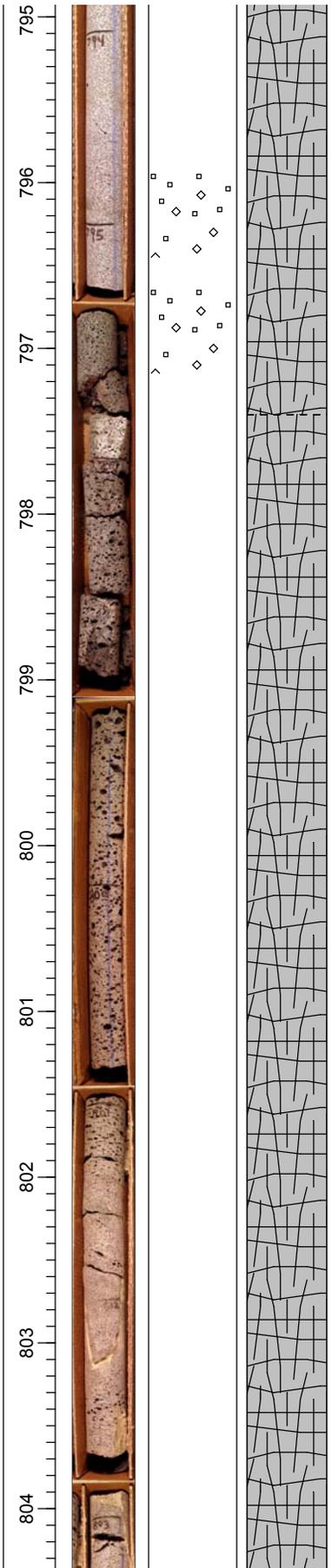
**BASALT:**  
COLOR: 5YR 4/1 Brownish Gray at top grading to N4 Medium Dark Gray  
TEXTURE: Aphanitic, basalt; vesicular from 757.3 feet to 766.1 feet, massive from 766.1 feet to 785.8 feet, vesicular from 785.8 feet to 797.4 feet, flow and mold structure at base  
COMPOSITION: 45% plagioclase, 2% olivine, 5% pyroxene, 48% groundmass; plagioclase is submillimeter laths with rare 1 millimeter tabular laths, olivine is anhedral microcrysts, pyroxene is euhedral grains  
XENOLITHS/AUTOLITHS: None noted  
ALTERATION: 5YR 8/1 Pinkish Gray non-calclitic mud in fracture near top, mild alteration to iddingsite



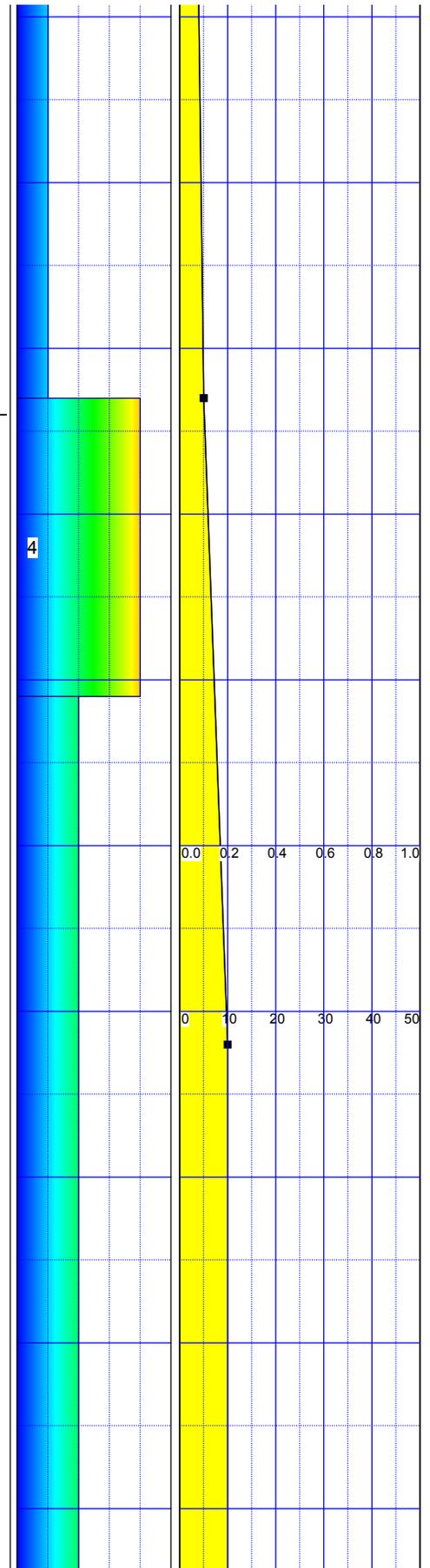


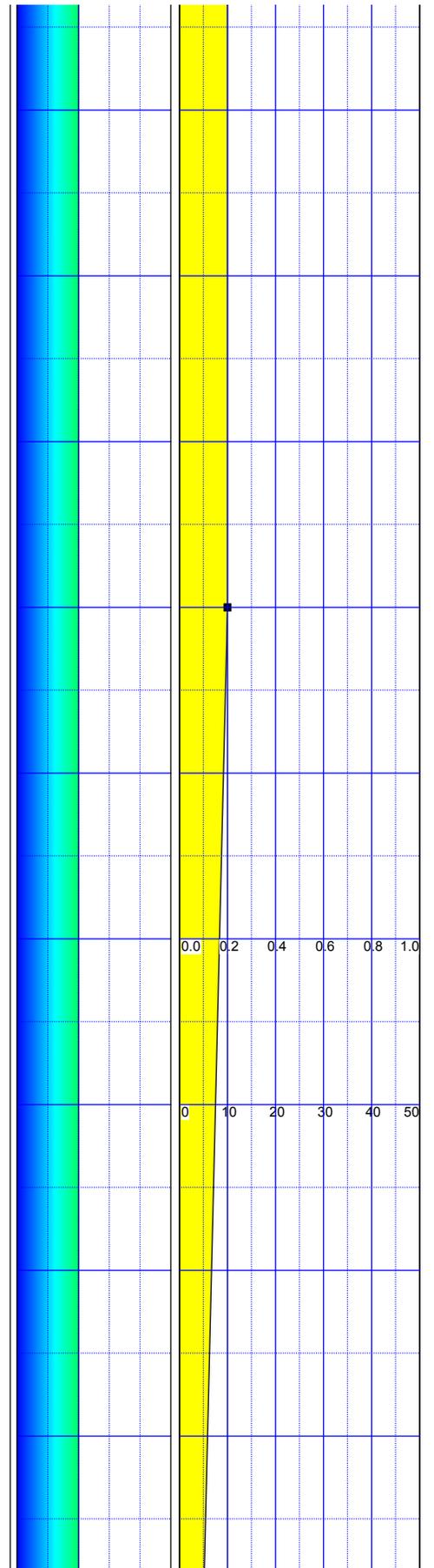
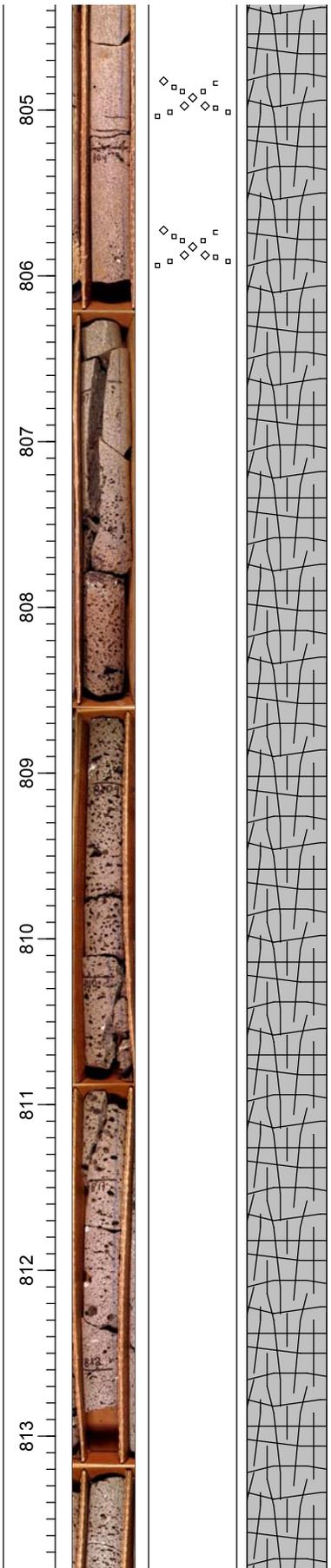


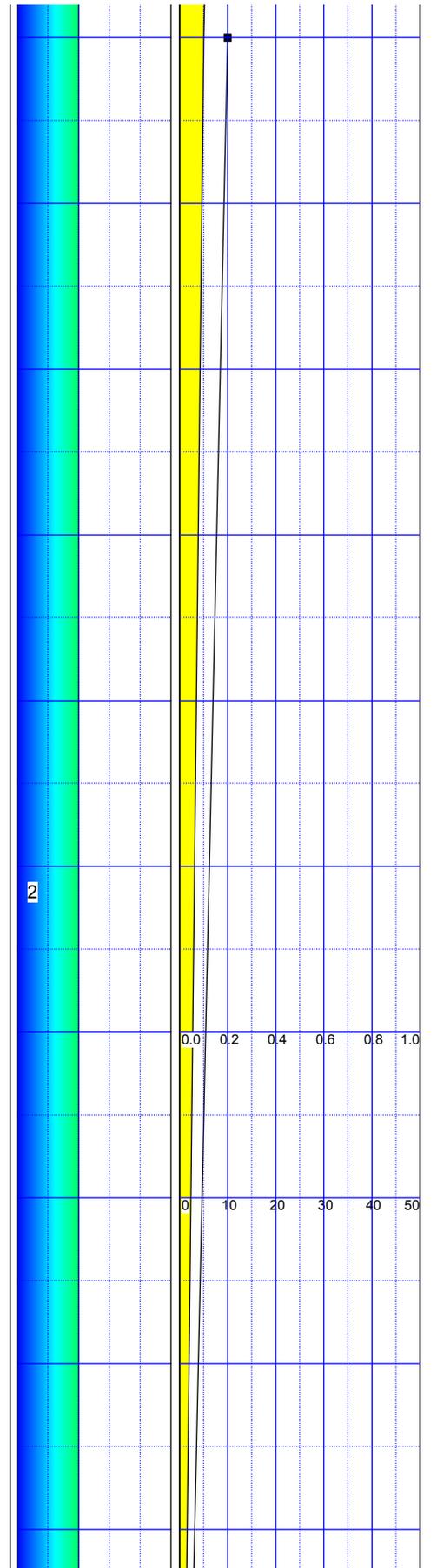
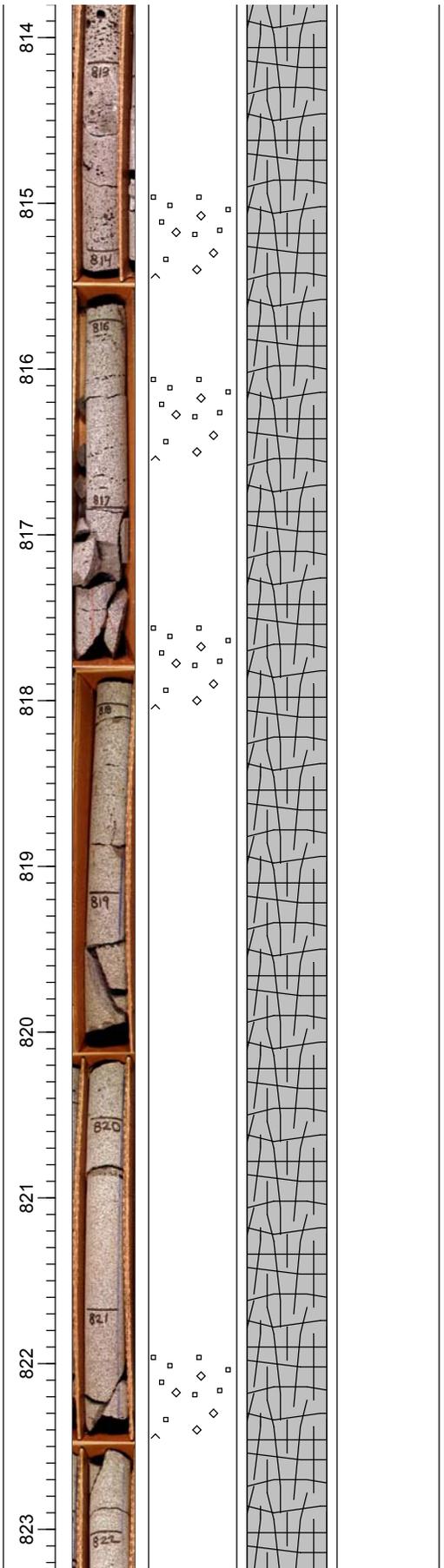


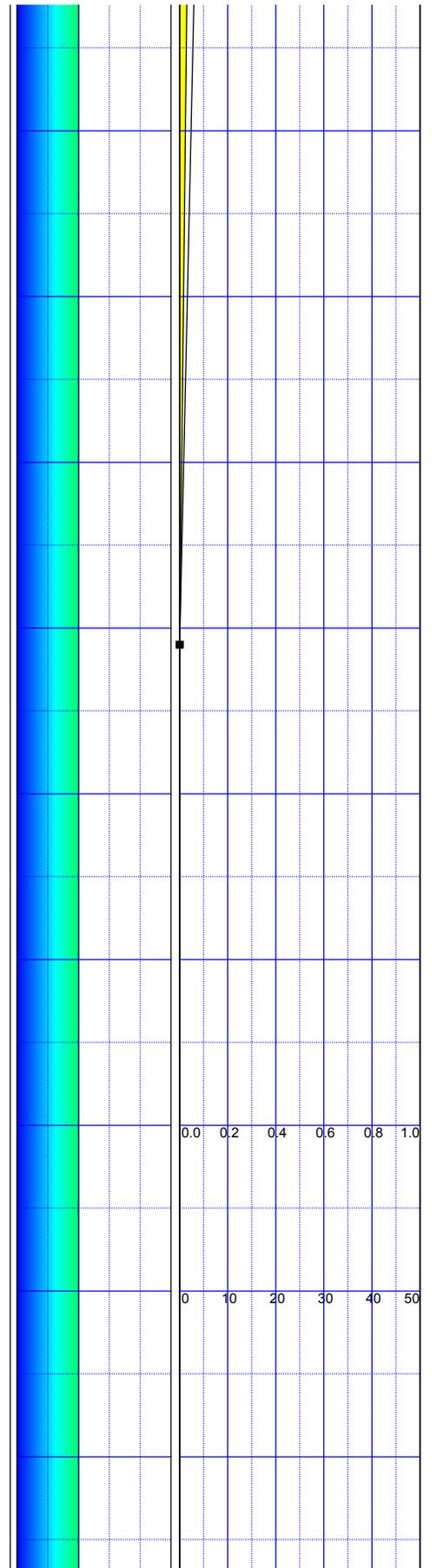
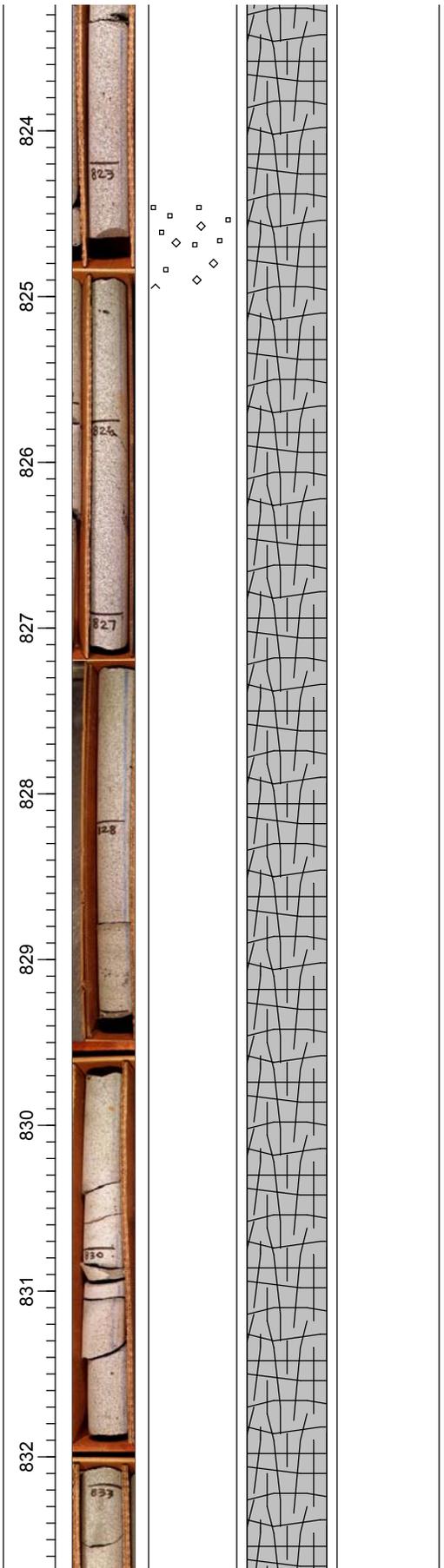


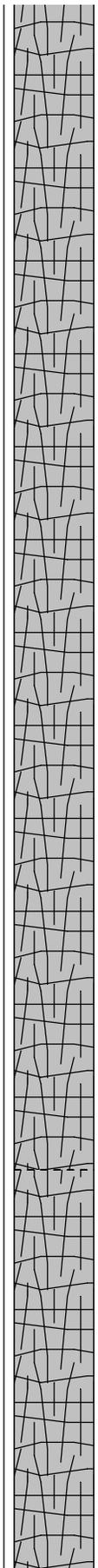
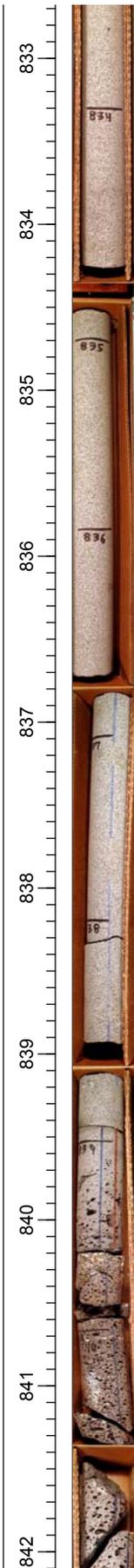
**BASALT:**  
**COLOR:** 5YR 4/1 Brownish Gray  
**TEXTURE:** Phaneritic, diktytaxitic basalt;  
 vesicular from 797.4 feet to 801.2 feet,  
 massive from 801.2 feet to 808.0 feet,  
 vesicular from 808.0 feet to 814.2 feet,  
 massive from 814.2 feet to 827.1 feet,  
 vesicular from 827.1 feet to 839.0 feet,  
 vesicular from 839.0 feet to 839.7 feet,  
 rubbly zone at base  
**COMPOSITION:** 25% plagioclase, 10% olivine,  
 2% pyroxene; plagioclase is submillimeter  
 laths, olivine is 1 to 2 millimeter  
 subhedral to euhedral glomerocrysts,  
 pyroxene is mostly submillimeter subhedral  
 grains  
**XENOLITHS/AUTOLITHS:** Up to 6 millimeter  
 dogtooth spar present  
**ALTERATION:** 5YR 7/2 Grayish Orange Pink  
 mud in fractures near top, N8  
 calcitic mud in fractures near bottom,  
 moderate alteration



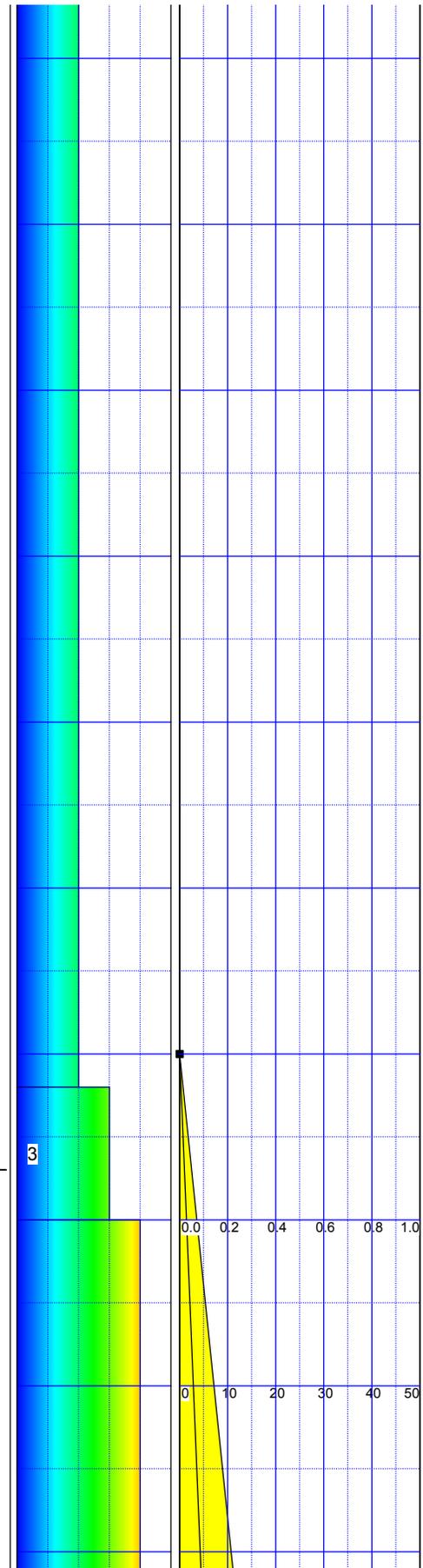


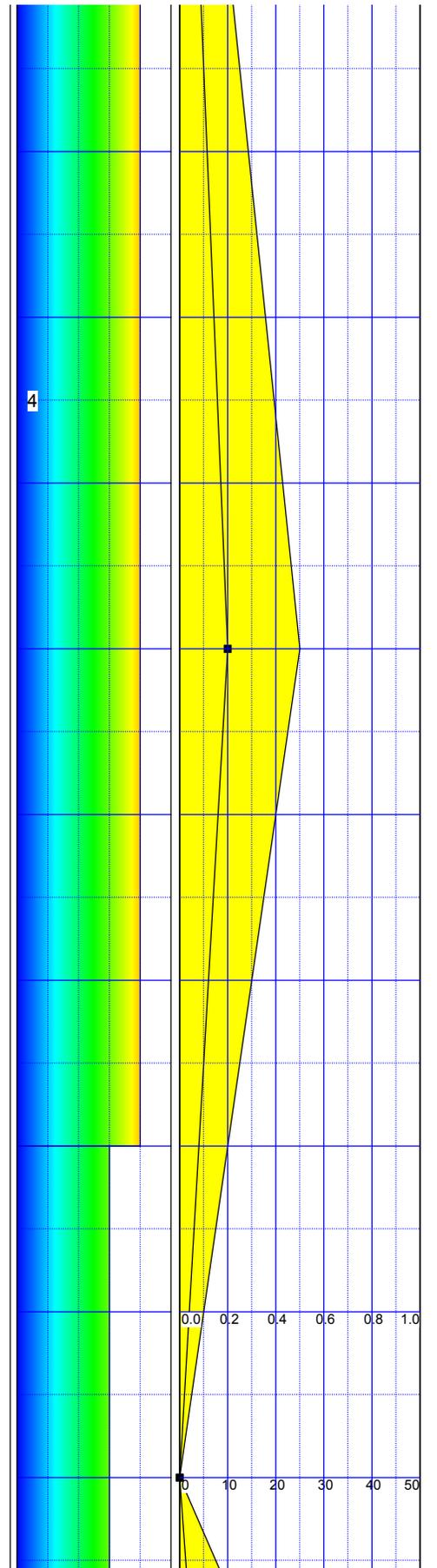
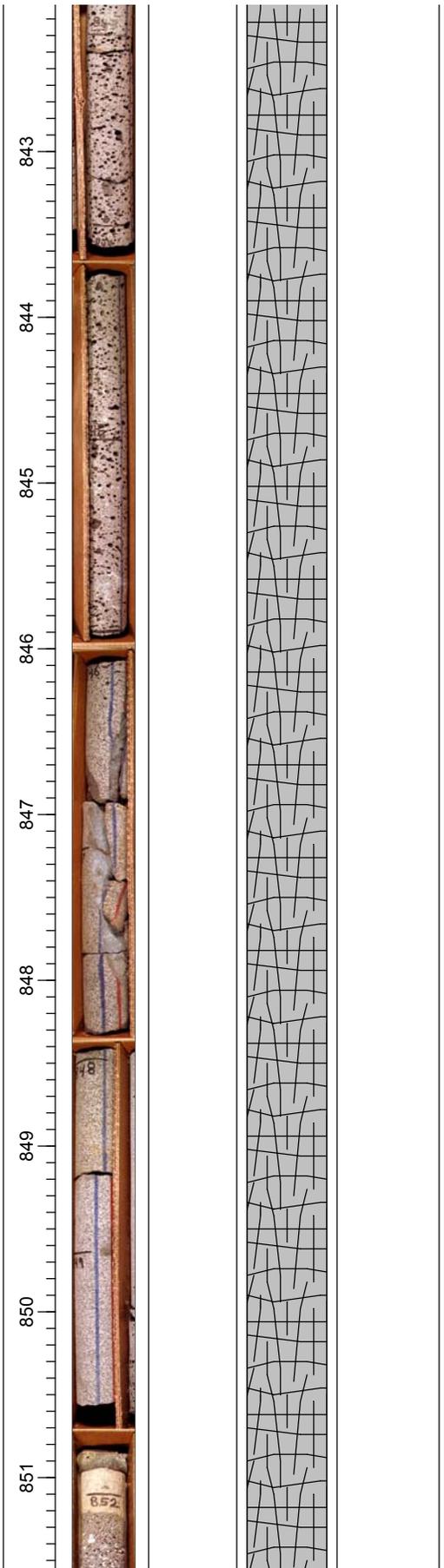


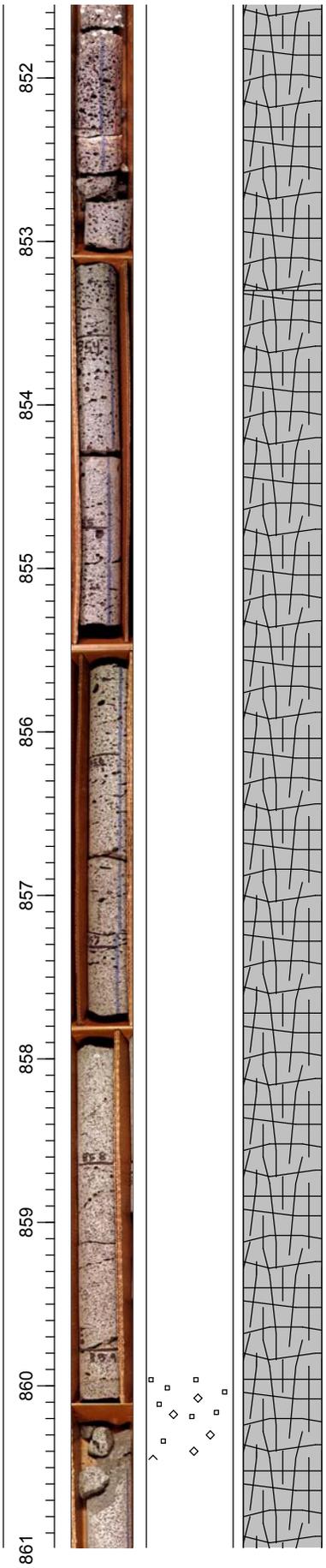




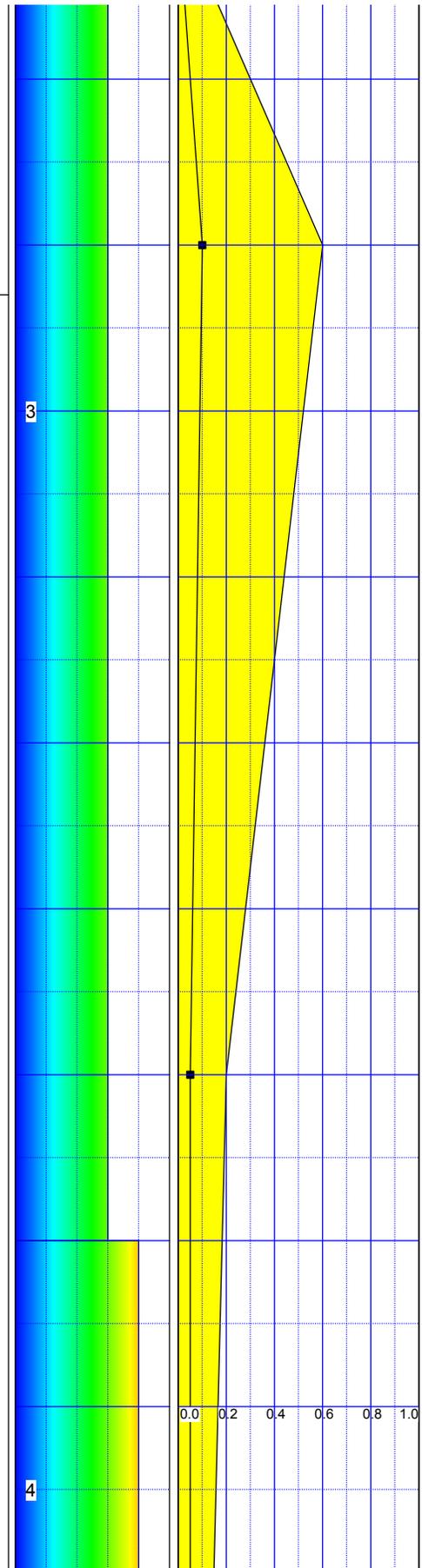
BASALT:  
 COLOR: N4 Medium Dark Gray  
 TEXTURE: Aphanitic, diktytaxitic basalt;  
 vesicular from 839.7 feet to 846.0 feet,  
 massive from 846.0 feet to 851.0 feet  
 vesicular from 851.0 to 853.3 feet, rubbly  
 zone at base  
 COMPOSITION: 25% plagioclase, 10% olivine,  
 1% pyroxene, 64% groundmass; plagioclase is  
 submillimeter to 1 millimeter tabular laths,  
 olivine is submillimeter to 2 millimeter  
 subhedral to euhedral microcrysts and  
 glomerocrysts, pyroxenes are submillimeter  
 to 1 millimeter subhedral grains  
 XENOLITHS/AUTOLITHS: Rare 1 millimeter  
 calcite grains  
 ALTERATION: 5YR 8/1 calcitic mud in vesicles  
 near top

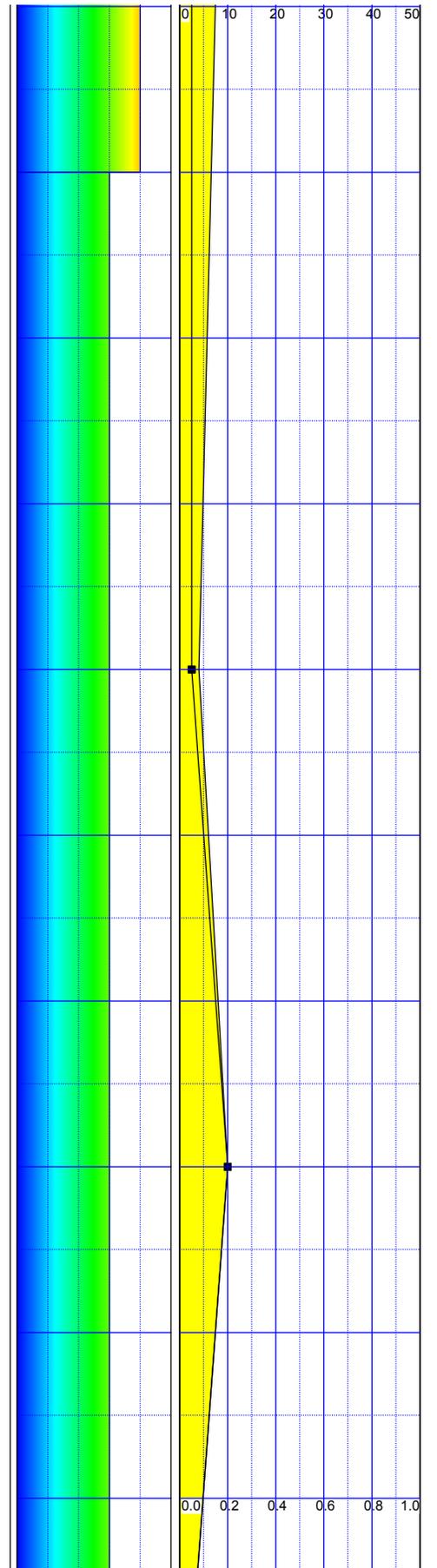
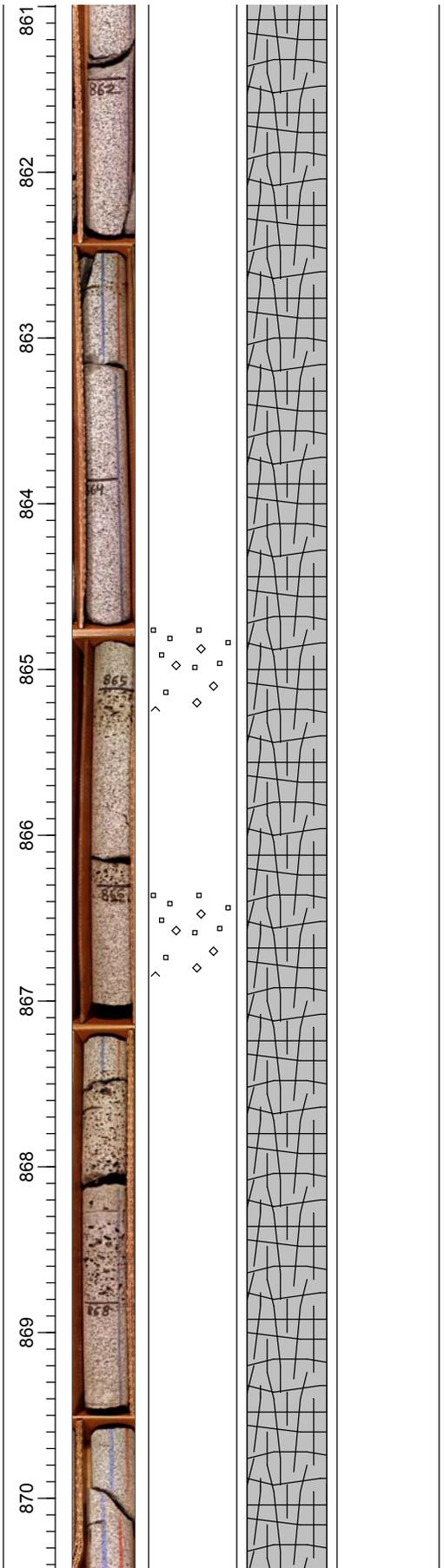


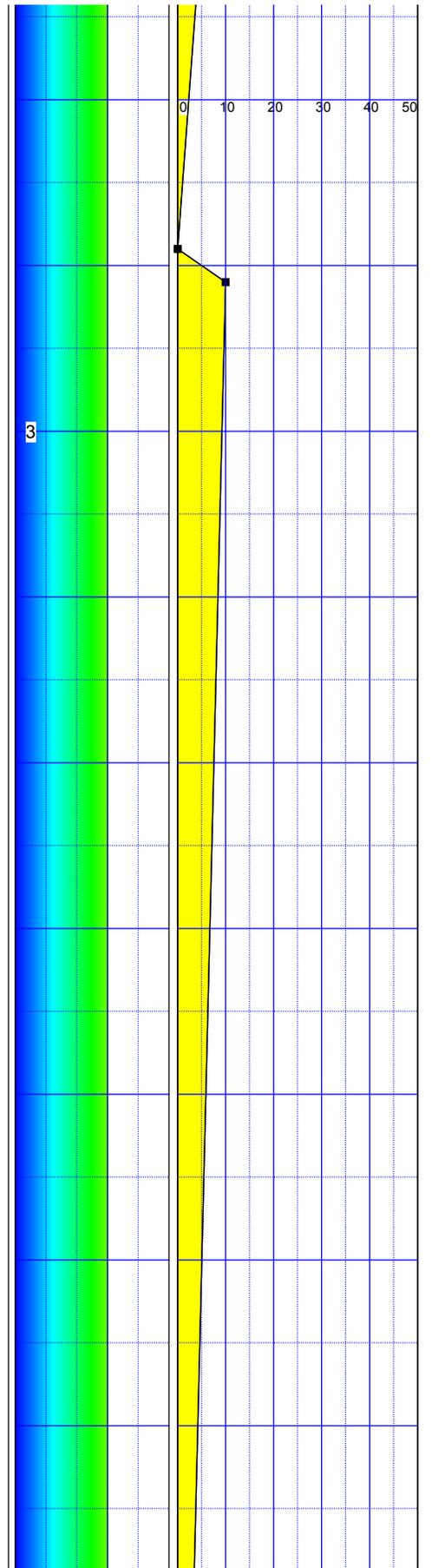
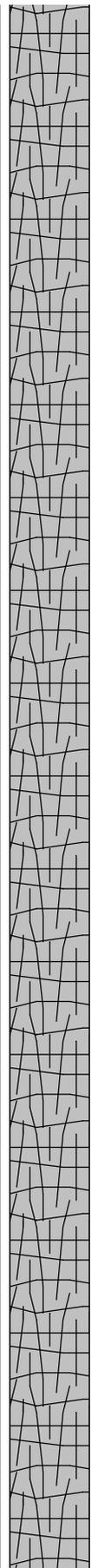


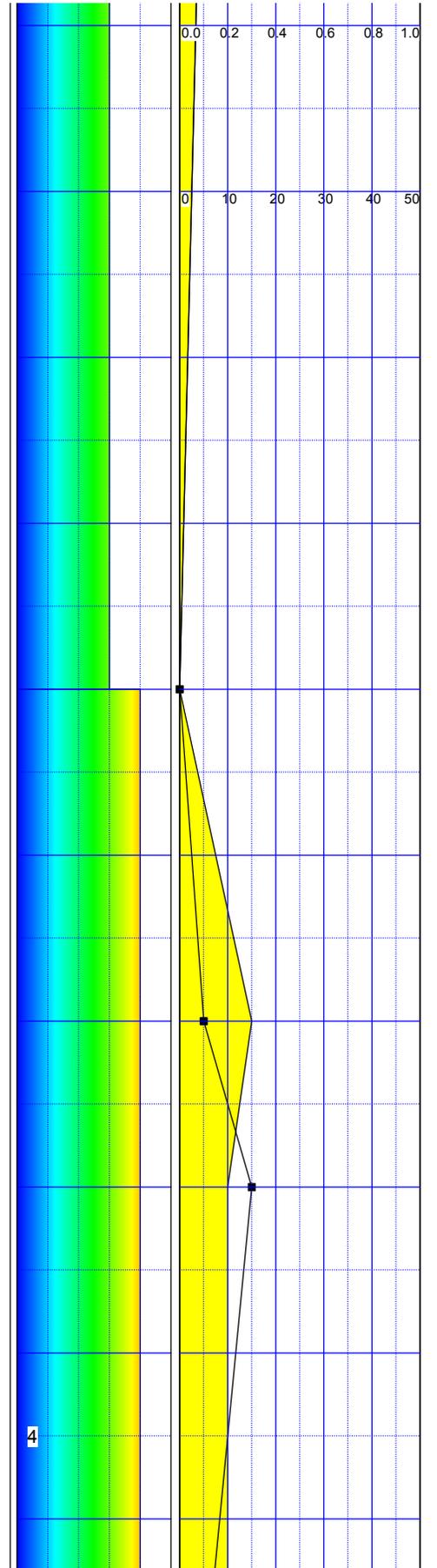
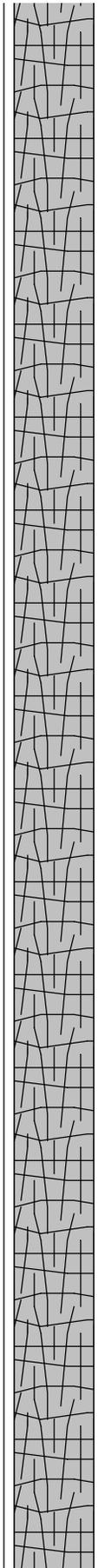
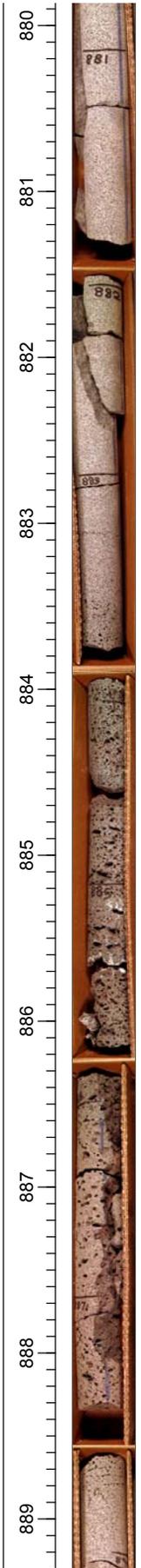


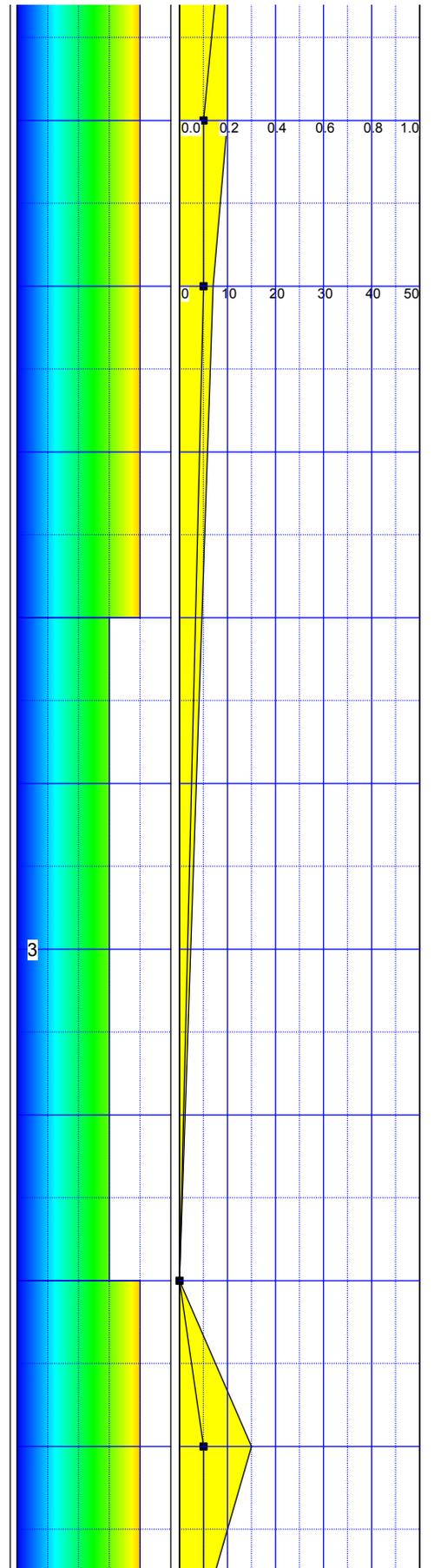
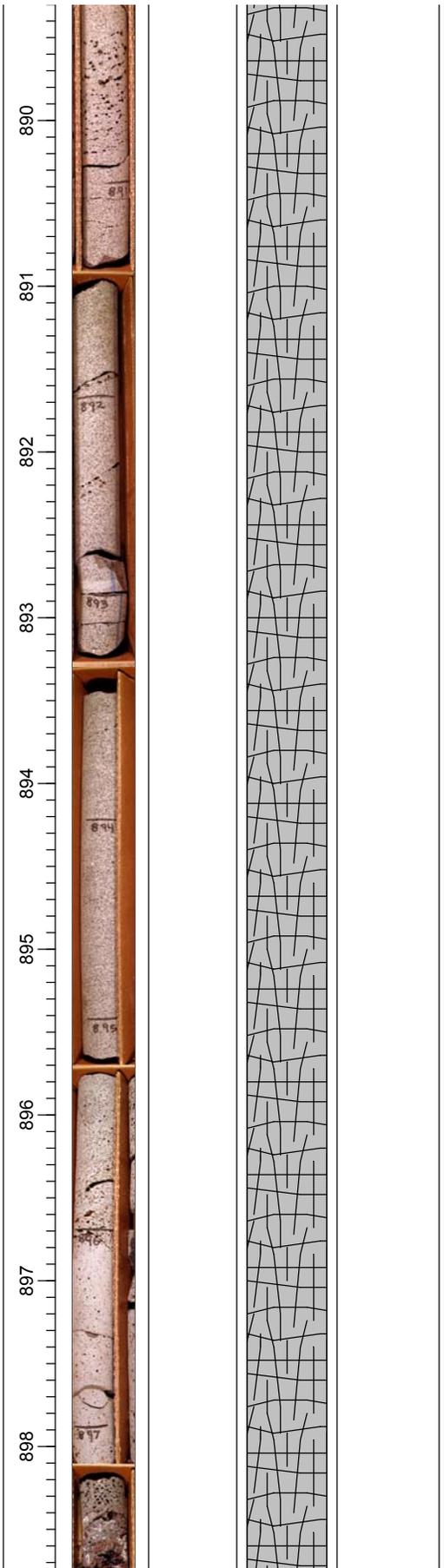
**BASALT:**  
**COLOR:** N3 Dark Gray grading to N5 Medium Gray  
**TEXTURE:** Aphanitic, diktytaxitic basalt; vesicular from 853.3 feet to 868.0 feet, massive from 868.0 feet to 871.9 feet, vesicular from 871.9 feet to 872.1 feet, massive from 872.1 feet to 884.0 feet, vesicular from 884.0 feet to 899.6 feet, flow and mold structure at bottom  
**COMPOSITION:** 35% plagioclase, 25% olivine, 10% pyroxenes, 30% groundmass; plagioclase is submillimeter to 1 millimeter tabular laths, olivine is submillimeter subhedral to euhedral microcrysts  
**XENOLITHS/AUTOLITHS:** Calcite in vesicles near top  
**ALTERATION:** N7 Very Light Gray calcitic mud in vesicles near top, olivine is heavily altered near base of interval

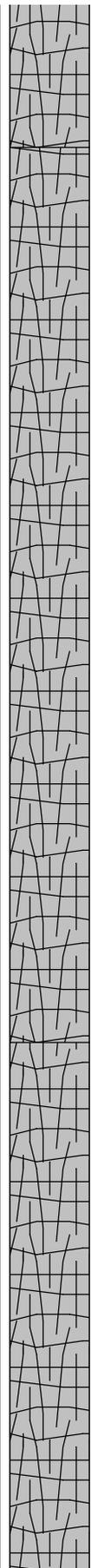
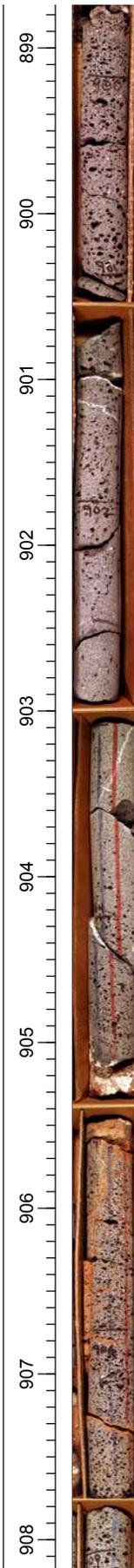






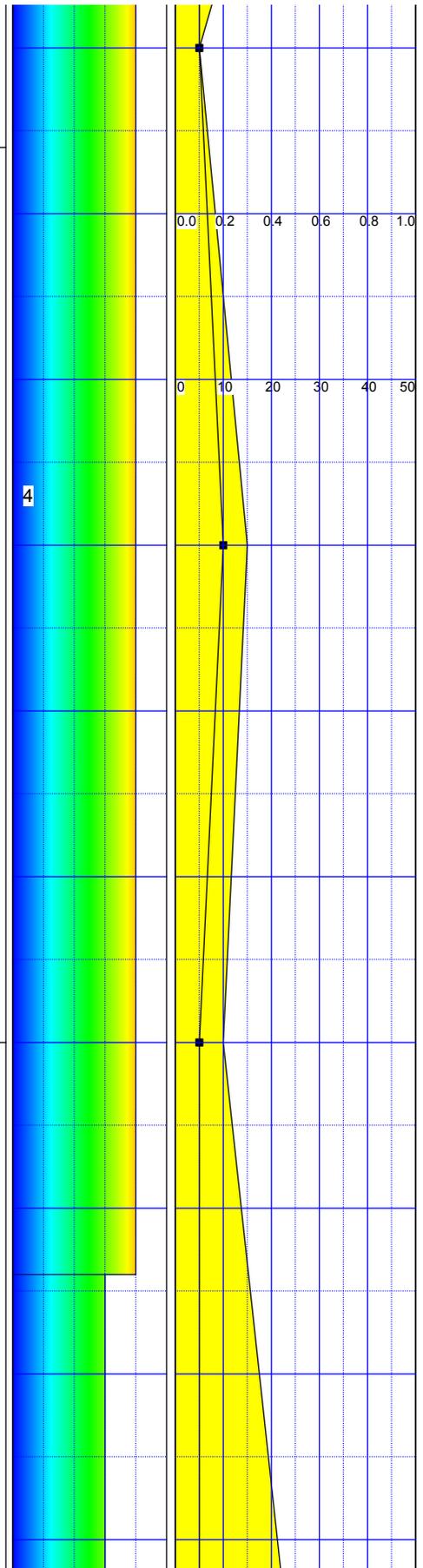


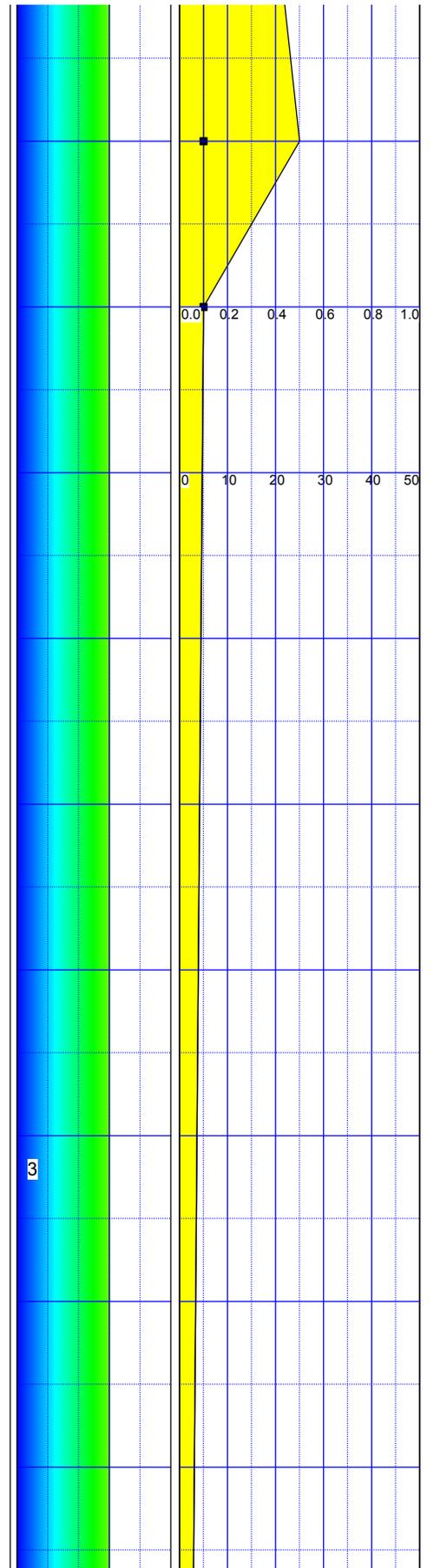
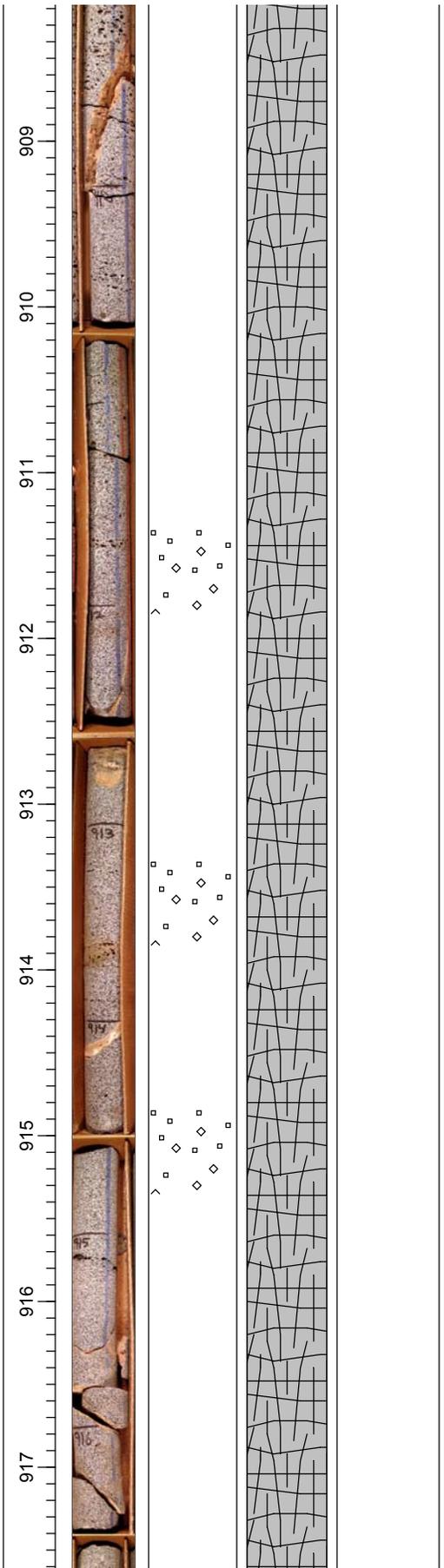


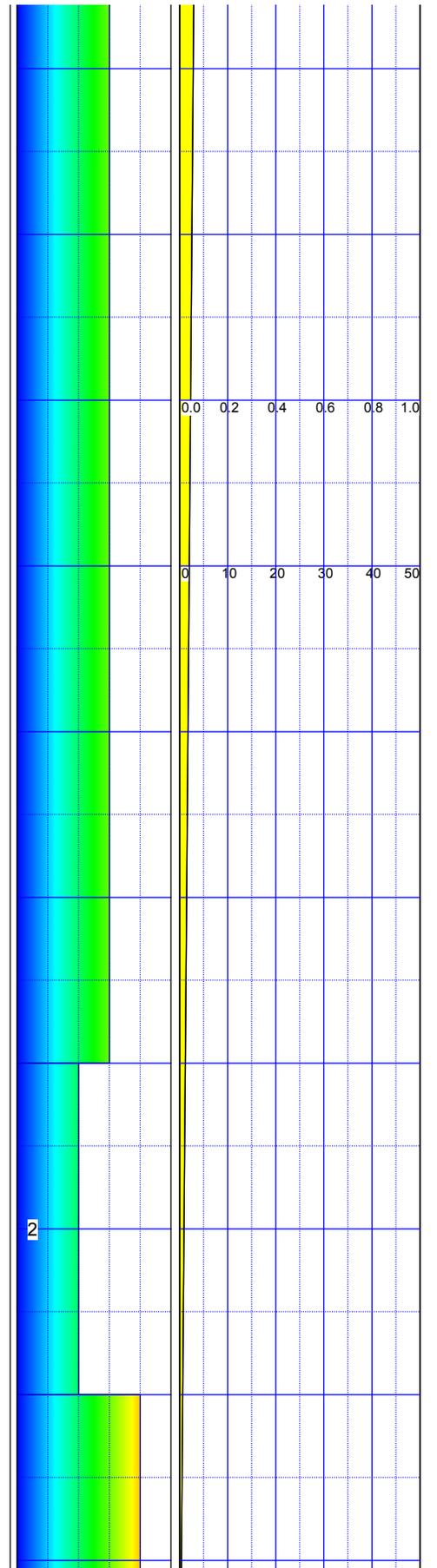
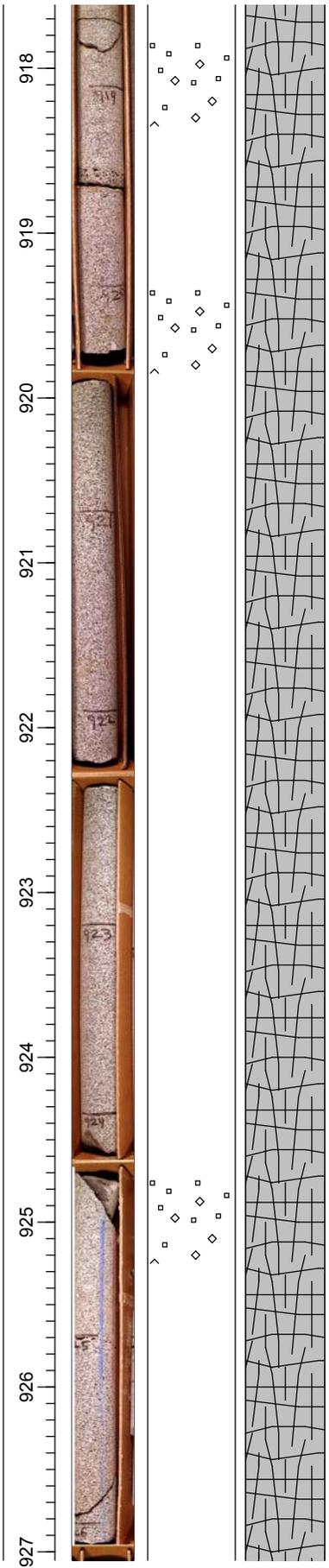


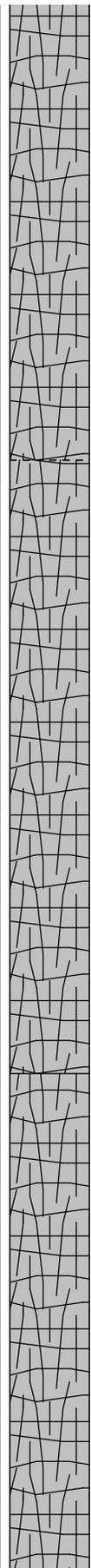
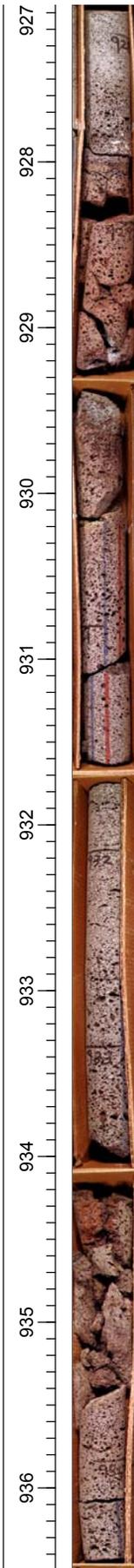
**BASALT:**  
**COLOR:** N4 Medium Dark Gray  
**TEXTURE:** Aphanitic, basalt; vesicular from 899.6 feet to 905.0 feet, flow and mold structure at base  
**COMPOSITION:** 25% plagioclase, 10% olivine, 65% groundmass; plagioclase is submillimeter tabular laths, olivine is submillimeter to 1 millimeter subhedral to euhedral microcrysts  
**XENOLITHS/AUTOLITHS:** Calcite in vesicles at 901.3 feet and 904.9 feet  
**ALTERATION:** N8 Light Gray calcitic mud in fractures, moderate alteration of olivine

**BASALT:**  
**COLOR:** N4 Medium Dark Gray  
**TEXTURE:** Phaneritic, basalt; vesicular from 905.0 to 910.0 feet, massive from 910.0 feet to 928.3 feet, vesicular from 928.3 feet to 929.8 feet, flow and mold structure at base  
**COMPOSITION:** 40% plagioclase, 10% olivine, 1% pyroxenes, 49% groundmass; plagioclase is submillimeter to 3 millimeter tabular laths, olivine is submillimeter subhedral microcrysts, pyroxenes are submillimeter euhedral grains  
**XENOLITHS/AUTOLITHS:** None noted  
**ALTERATION:** 5YR 4/1 Brownish Gray mud in fractures, slight alteration to olivine; calcite in vesicles at 905.1 feet



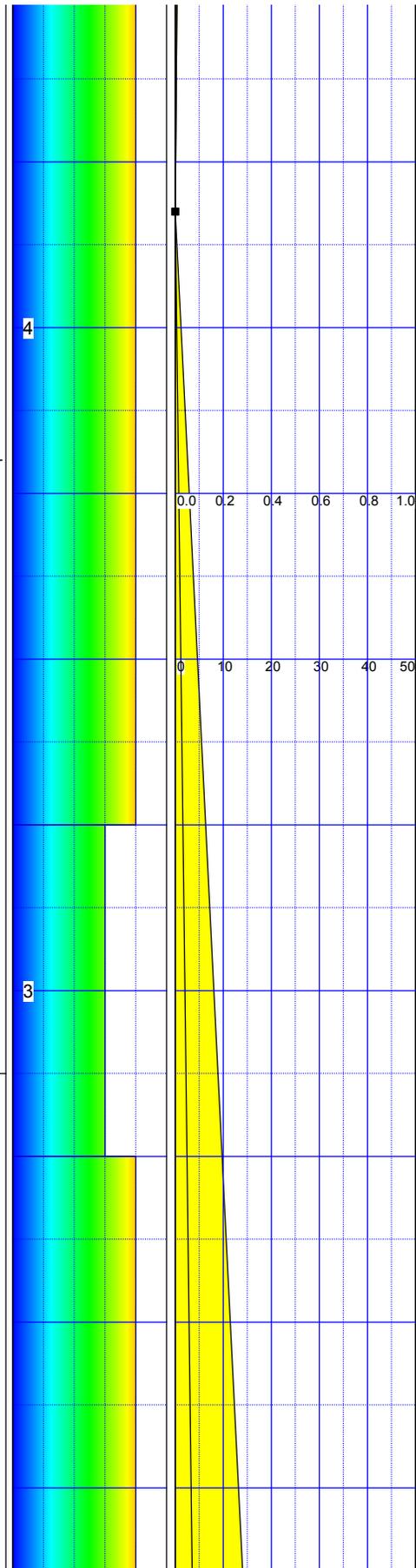


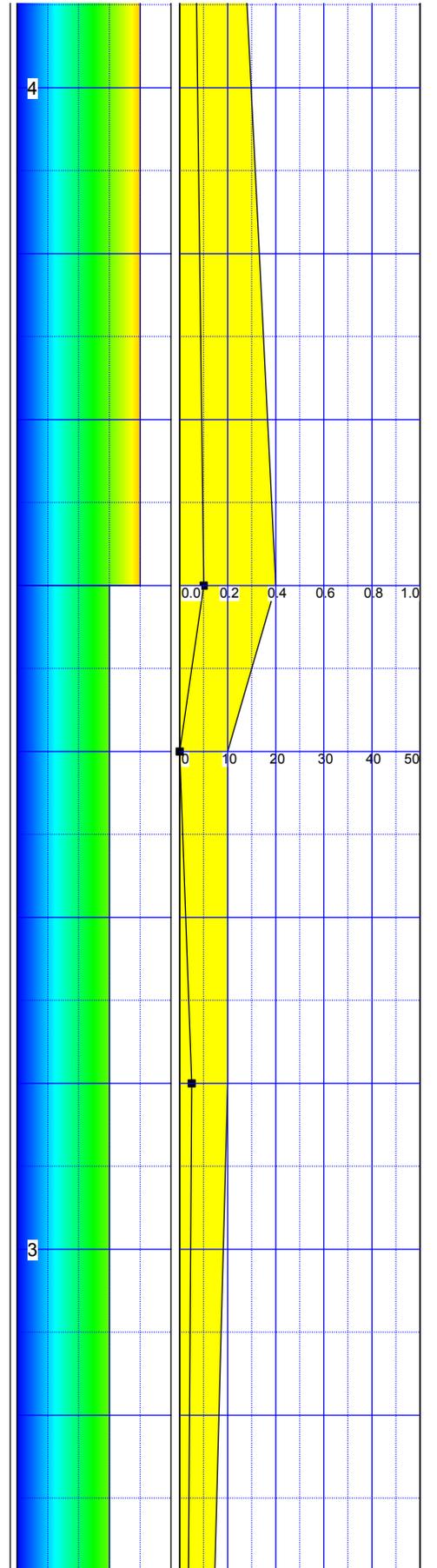
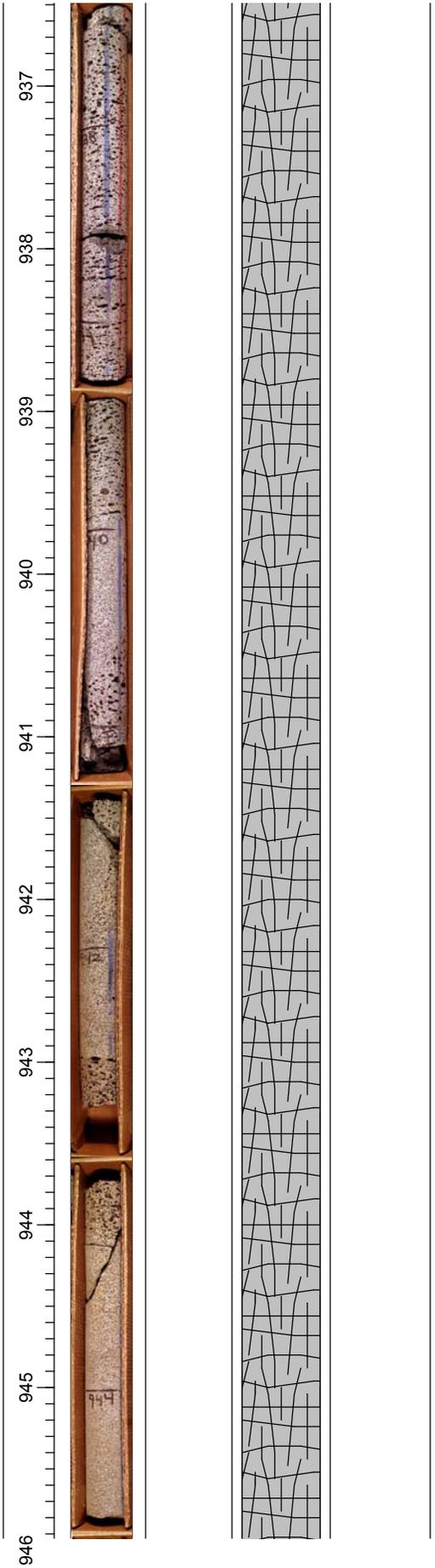


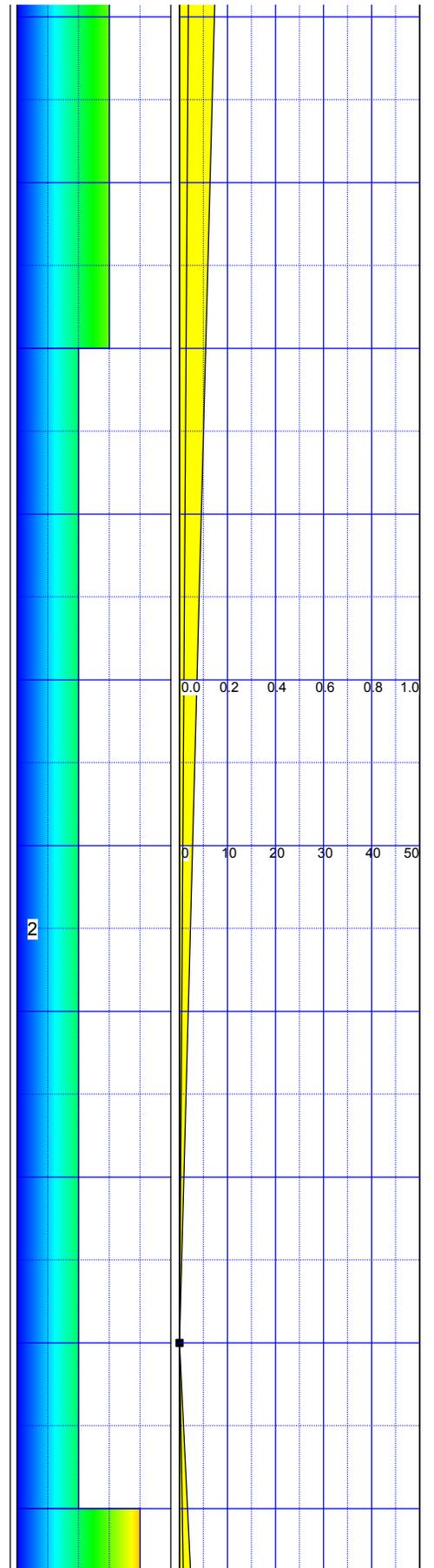
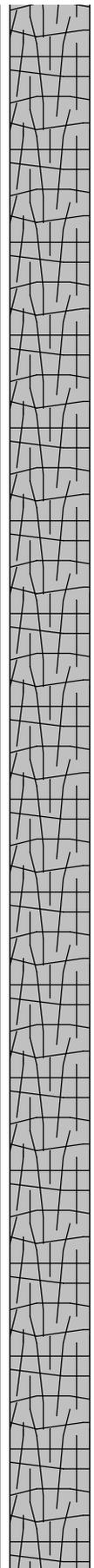
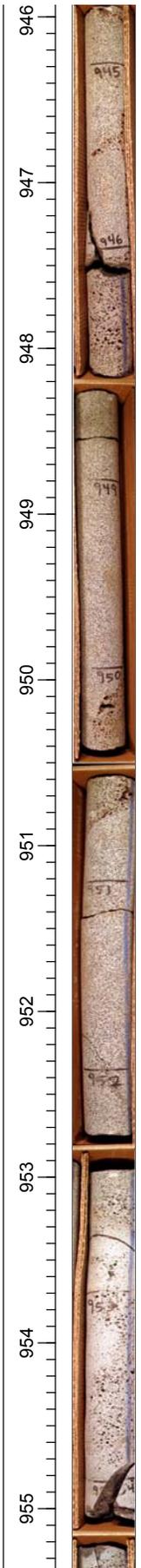


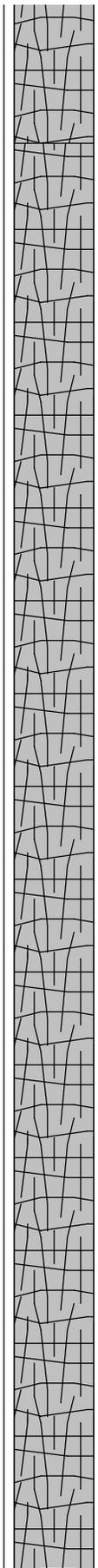
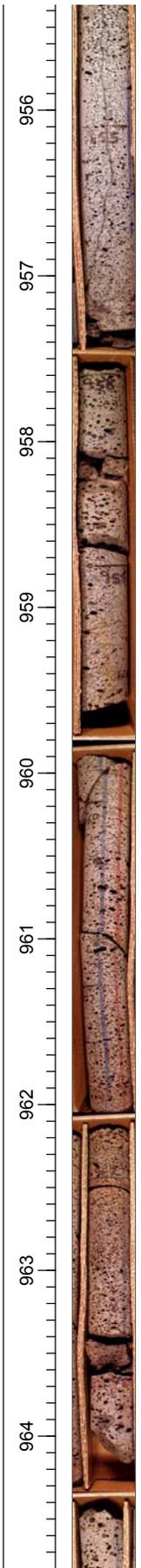
BASALT:  
 COLOR: 5YR 4/1 Brownish Gray grading to N4 Medium Dark Gray  
 TEXTURE: Aphanitic, basalt; vesicular from 929.8 feet to 933.5 feet; bubbly zone at base  
 COMPOSITION: 15% plagioclase, 3% olivine, 82% groundmass; plagioclase is submillimeter to extremely rare 2 millimeter laths, olivine is submillimeter microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Moderate alteration of olivine

BASALT:  
 COLOR: N3 Dark Gray grading to 5YR 4/1 Brownish Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicular from 933.5 feet to 943.0 feet, massive from 943.0 feet to 954.0 feet, vesicular from 954.0 feet to 956.2 feet; flow and mold structure at base  
 COMPOSITION: 15% plagioclase, 5% olivine, 85% groundmass; plagioclase is submillimeter laths, olivine is submillimeter subhedral microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Moderate alteration of olivine

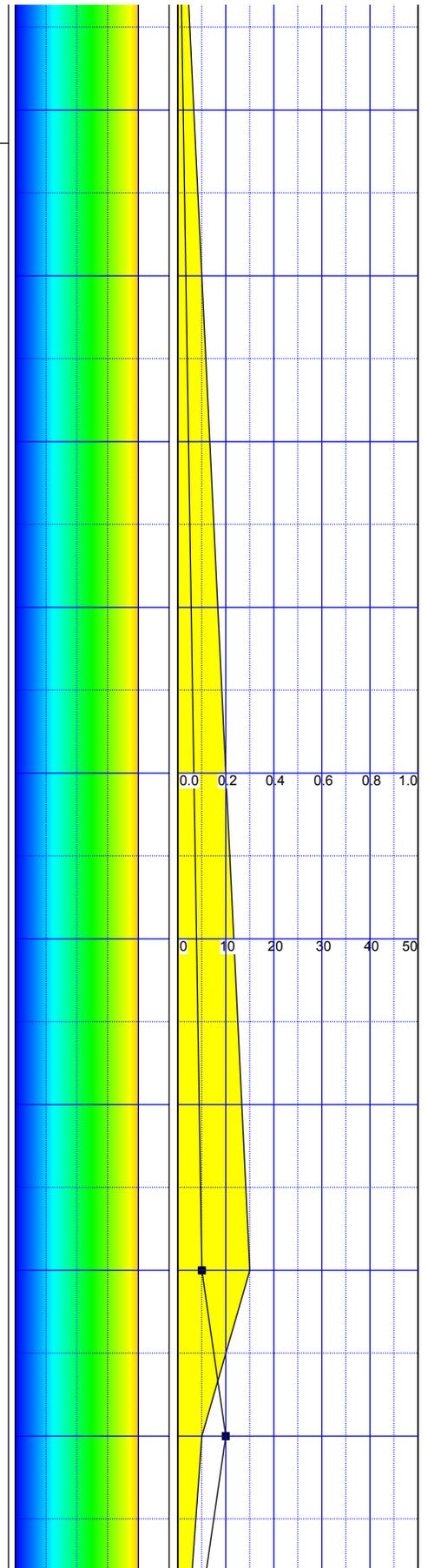


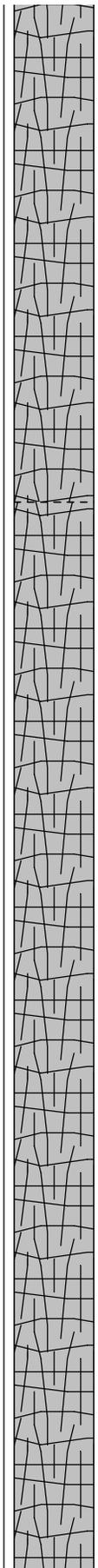
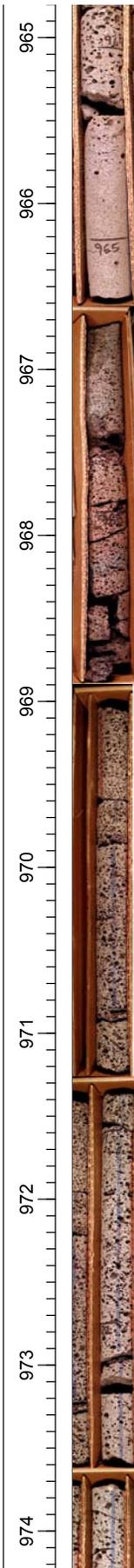




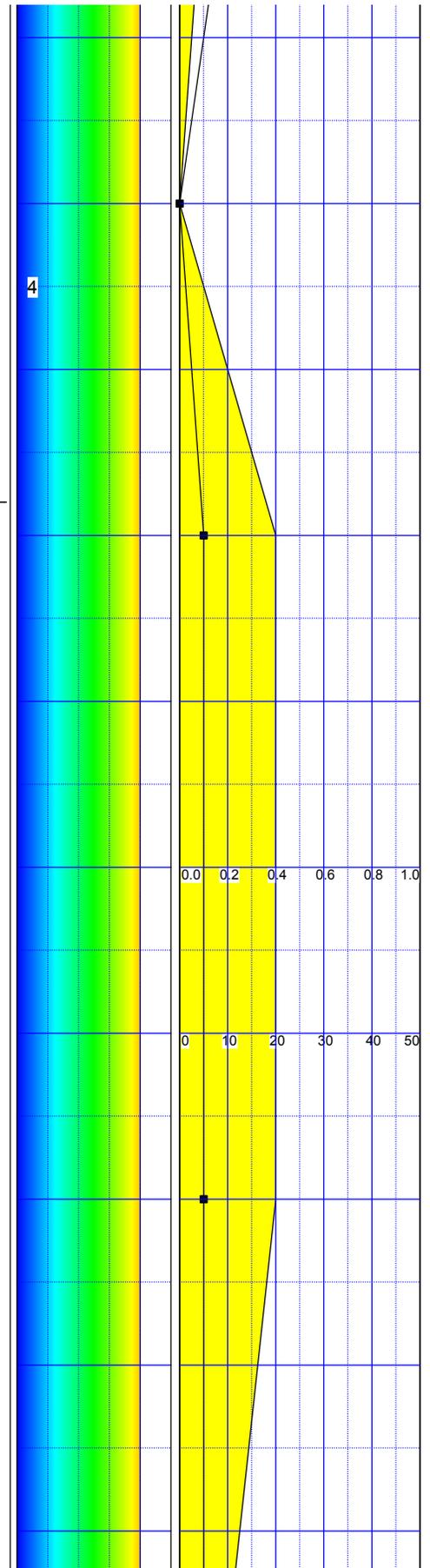


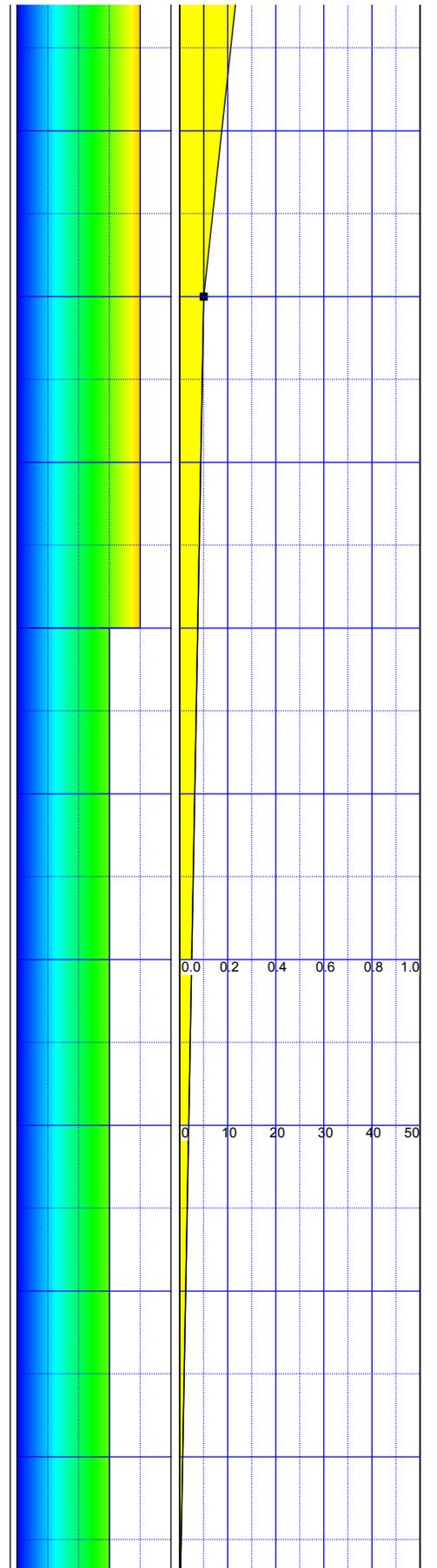
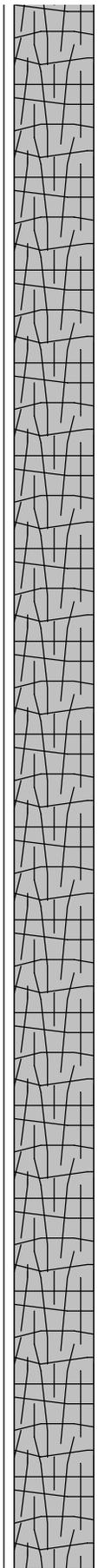
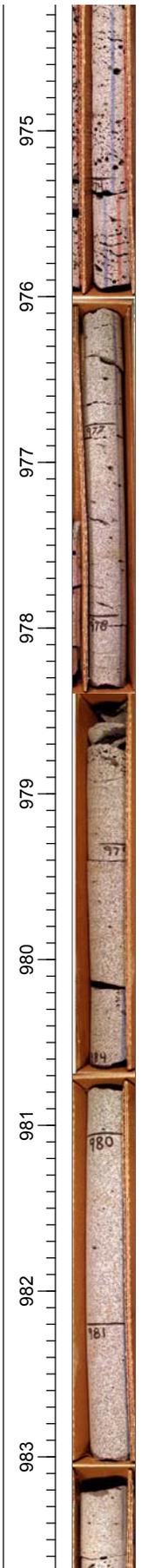
**BASALT:**  
 COLOR: 5YP 4/2 Grayish Red Purple grading to 5YR 4/1 Brownish Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicular from 956.2 feet to 940.0 feet, massive from 940.0 feet to 966.0 feet, vesicular from 966.0 feet to 967.8 feet flow and mold structure at bottom  
 COMPOSITION: 10% plagioclase, 5% olivine, 85% groundmass; plagioclase is submillimeter laths, olivine is submillimeter anhedral microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: N8 Very Light Gray calcite near top, heavy alteration of olivine

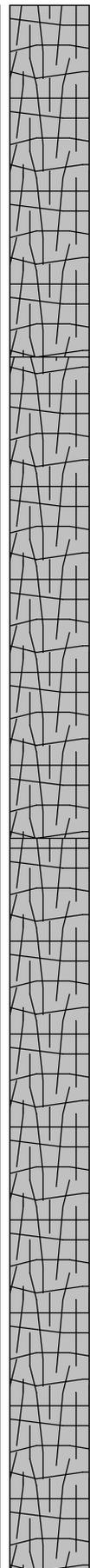
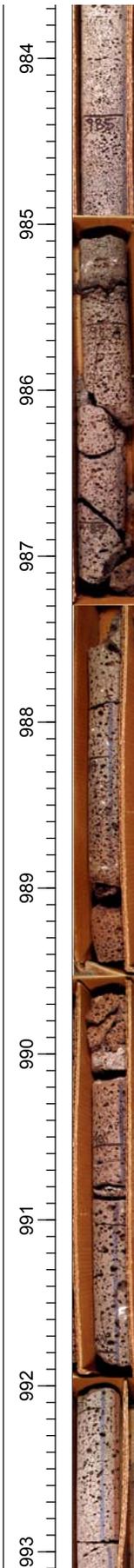




BASALT:  
 COLOR: 5RP 4/2 Grayish Red Purple grading to N4 Medium Dark Gray  
 TEXTURE: Aphanitic, vesicular basalt; vesicular from 967.0 feet to 976.0 feet, massive form 976.0 feet to 984.0 feet, vesicular from 984.0 feet to 985.6 feet; rubbly zone at base  
 COMPOSITION: 40% plagioclase, 15% olivine, 45% groundmass; plagioclase is mostly submillimeter laths with rare submillimeter acicular blades, olivine is submillimeter subhedral microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: None noted

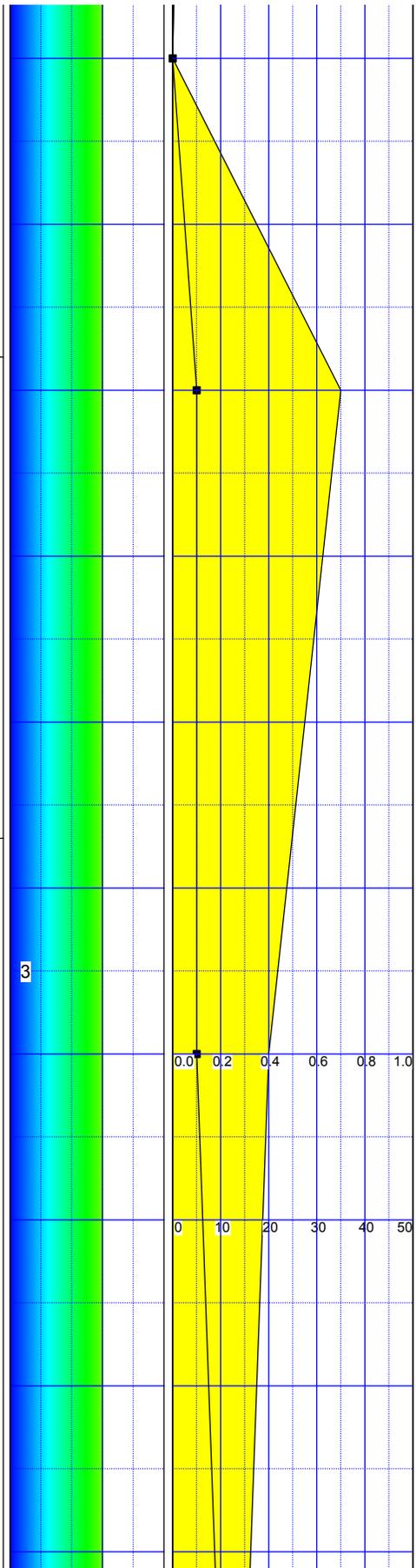


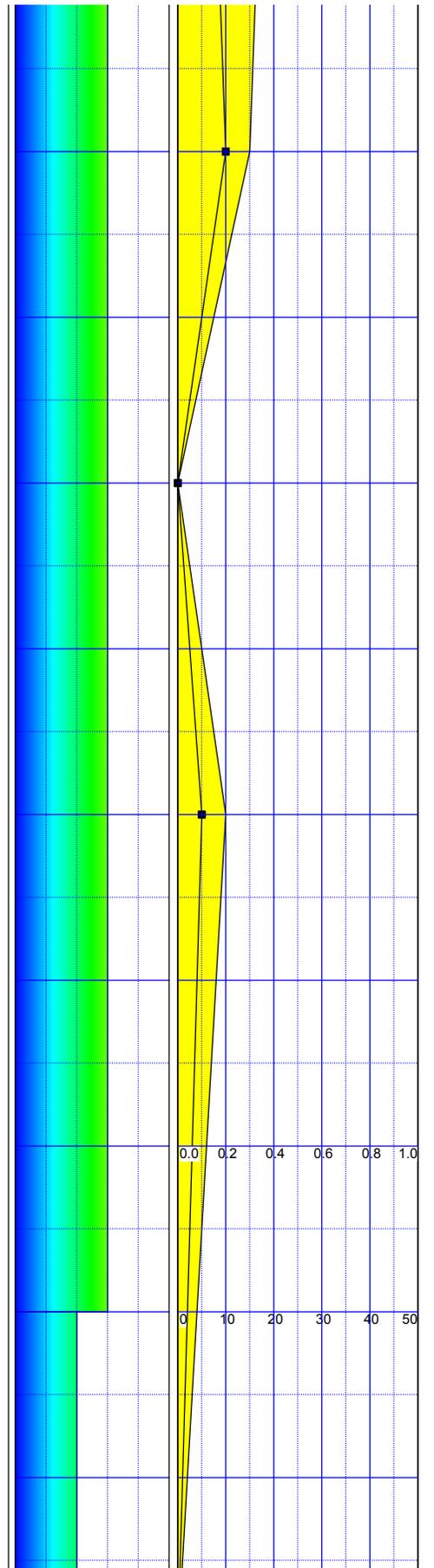
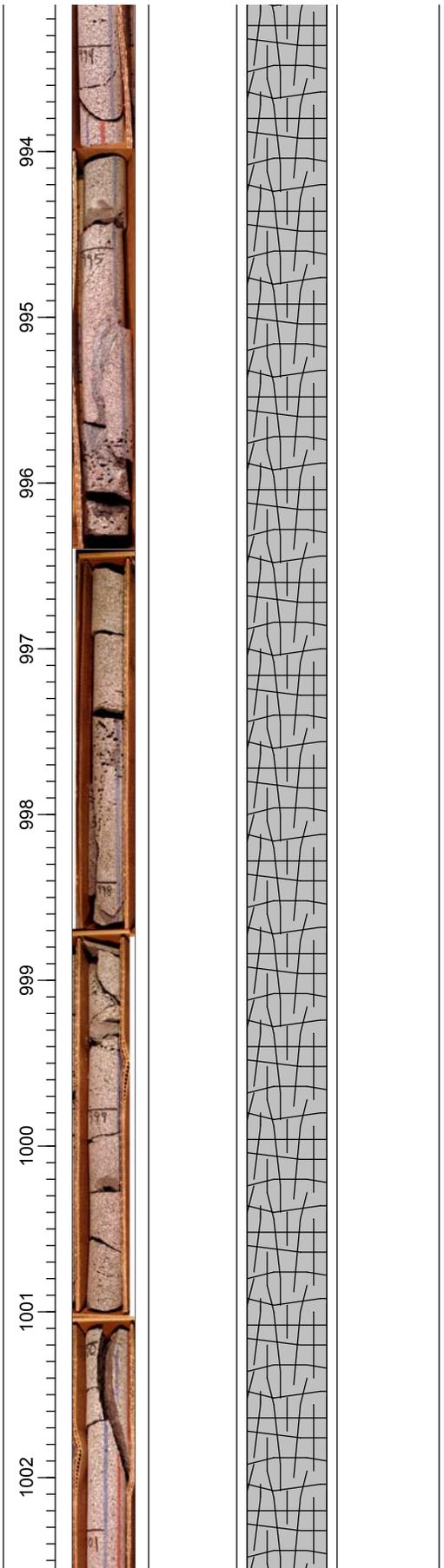


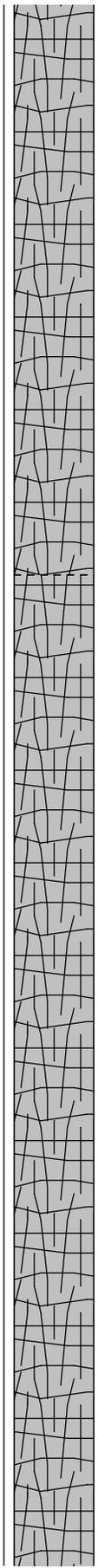
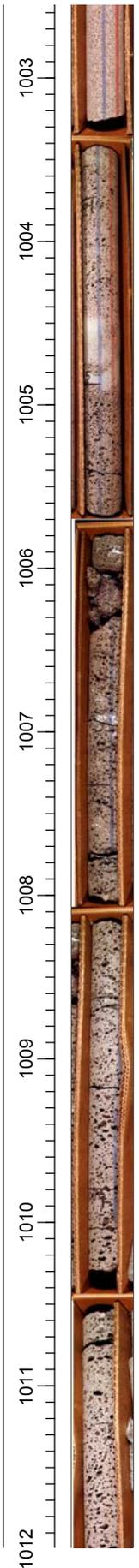


BASALT:  
 COLOR: 5RP 4/2 Grayish Purple Red  
 TEXTURE: Aphanitic, vesicular basalt;  
 vesicular from 985.8 to 988.7; flow and mold  
 structure at bottom  
 COMPOSITION: 10% plagioclase, 1% olivine,  
 89% groundmass; plagioclase is submillimeter  
 laths, olivine is submillimeter anhedral  
 microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: Heavy alteration of olivine

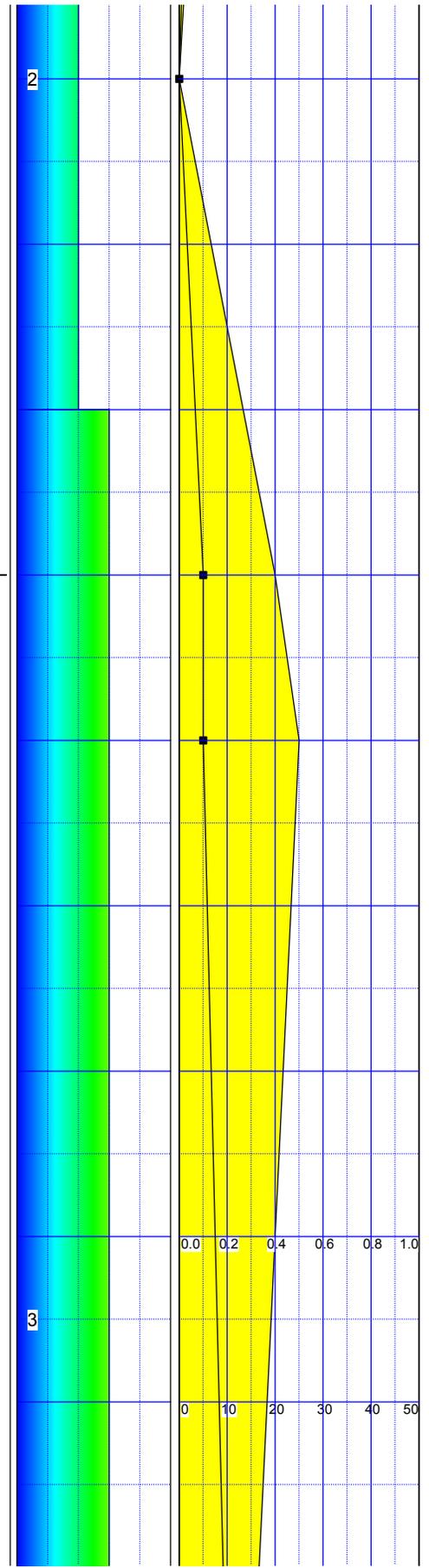
BASALT:  
 COLOR: 5RP 4/2 Grayish Purple Red  
 TEXTURE: Aphanitic, vesicular basalt;  
 vesicular from 988.7 feet to 994.0 feet,  
 massive from 994.0 feet to 996.0 feet,  
 vesicular from 996.0 feet to 998.0 feet,  
 massive from 998.0 feet to 1003.0 feet,  
 vesicular from 1003.0 feet to 1006.0 feet;  
 flow and mold structure at base  
 COMPOSITION: 10% plagioclase, 5% olivine;  
 85% groundmass; plagioclase is submillimeter  
 laths, olivine is submillimeter anhedral  
 microcrysts  
 XENOLITHS/AUTOLITHS: None noted  
 ALTERATION: N8 Very Light Gray calcite near  
 top, heavy alteration of olivine

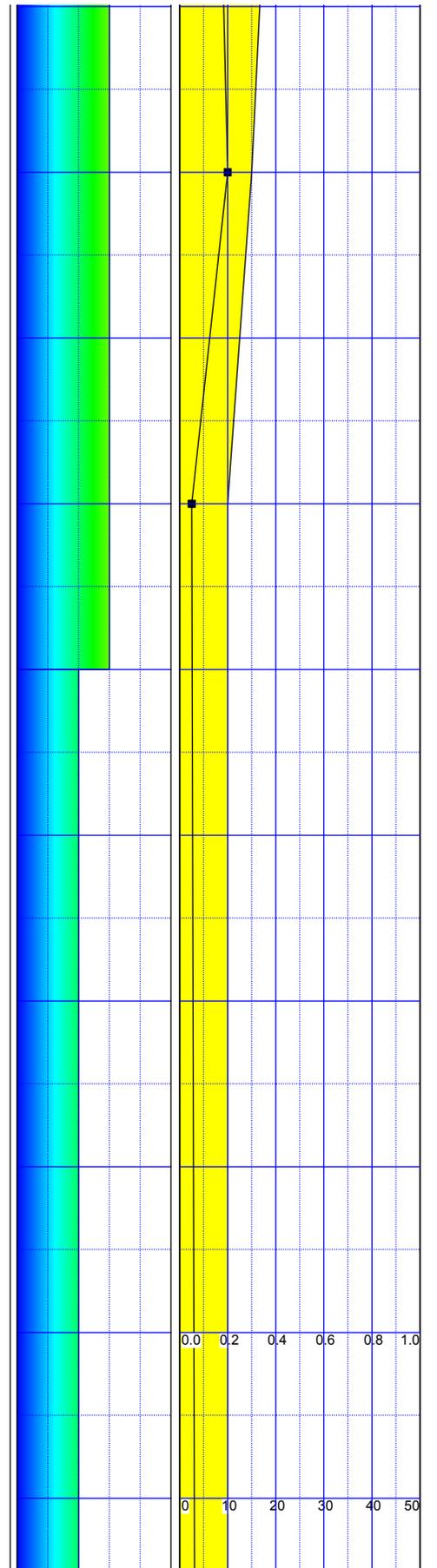
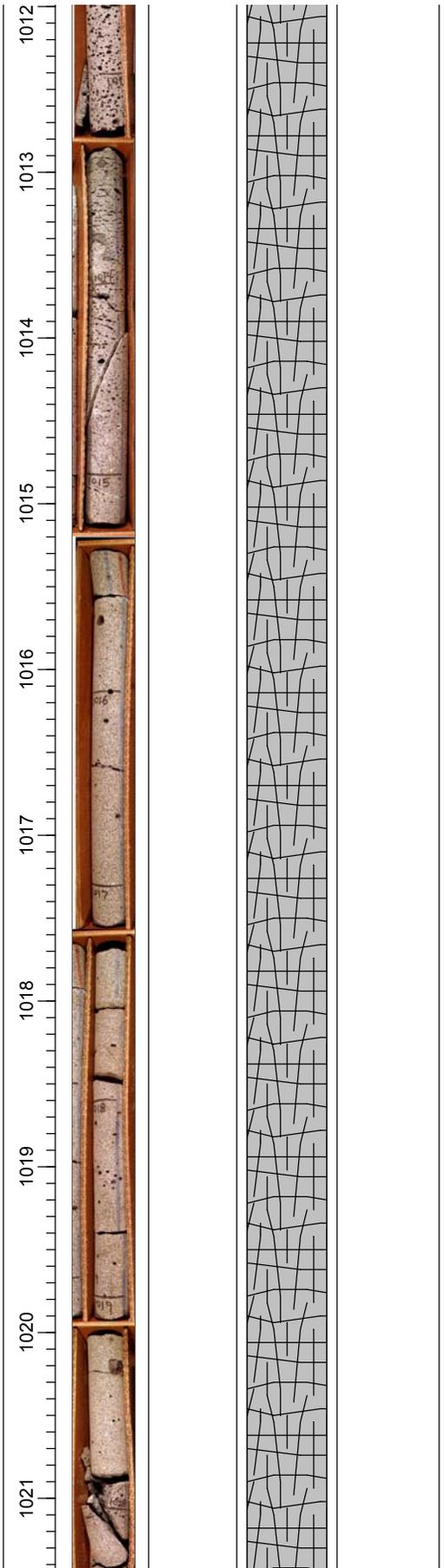


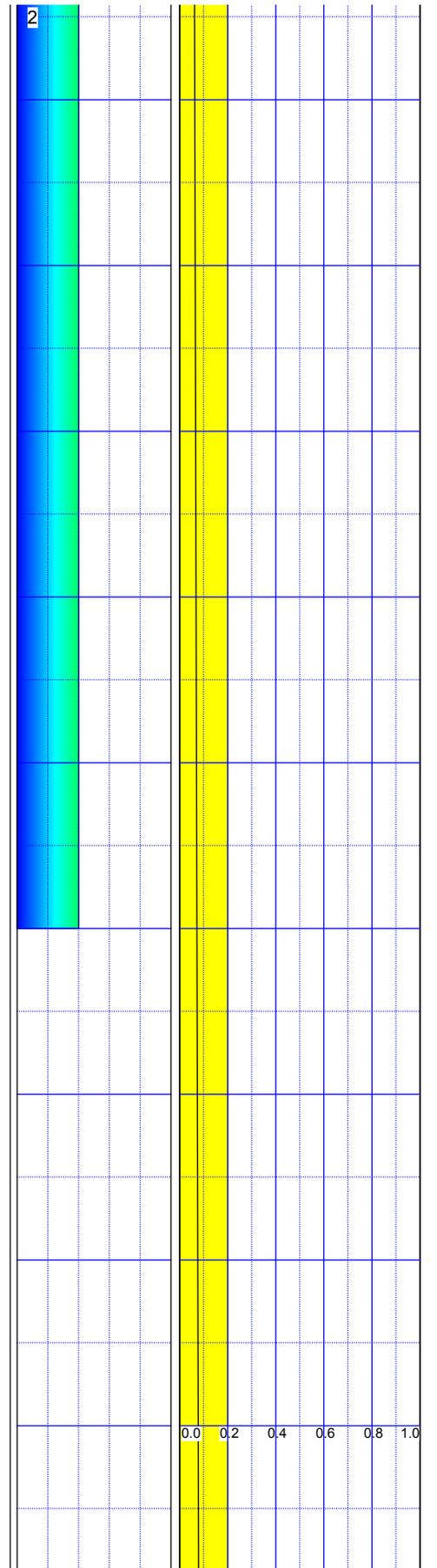
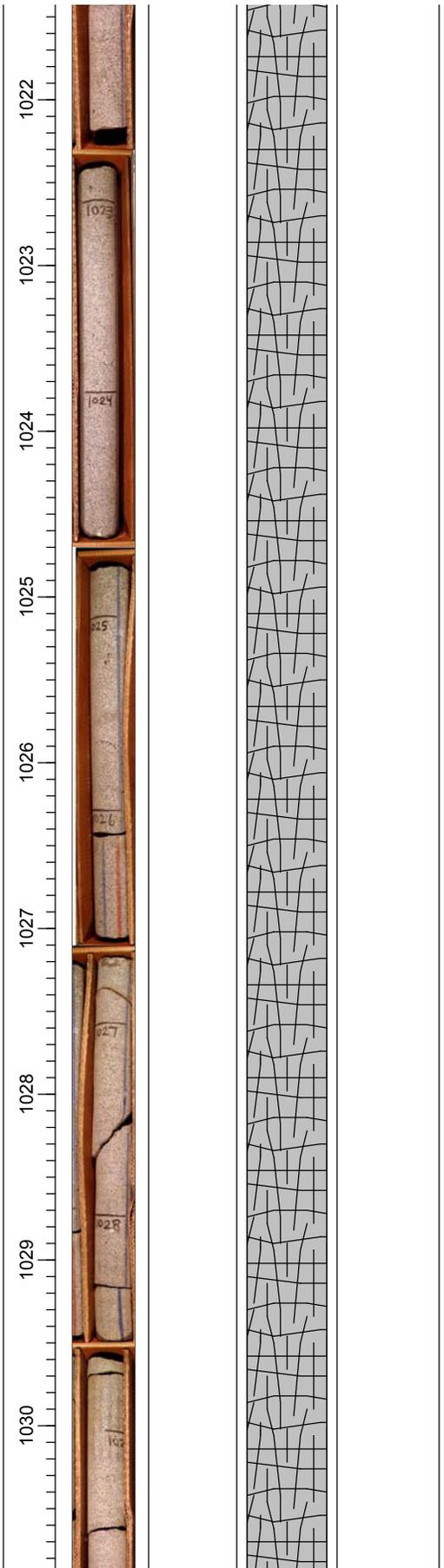


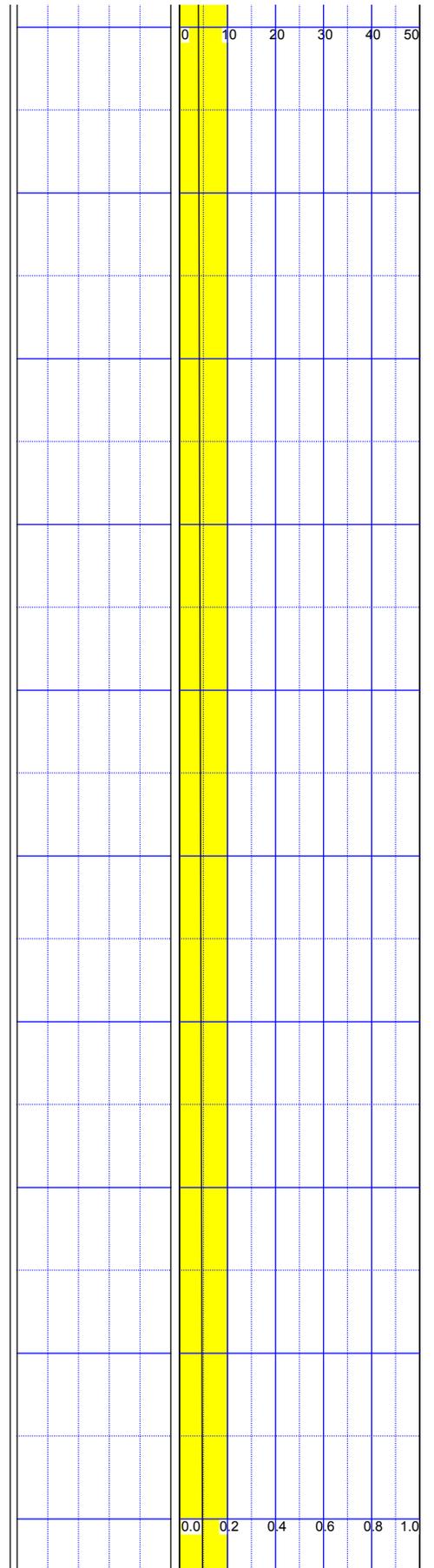
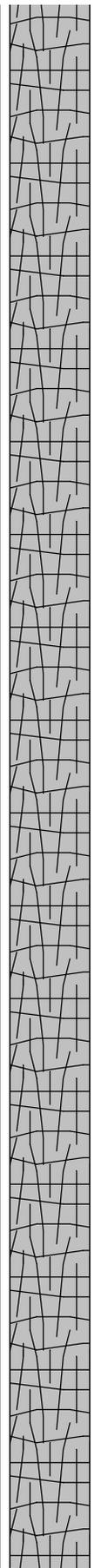


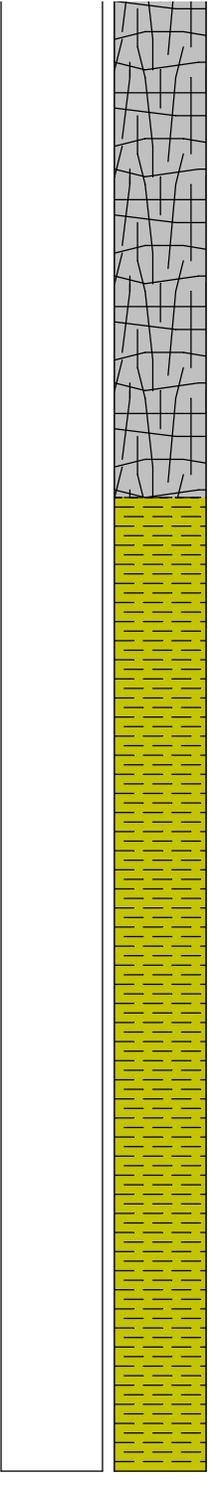
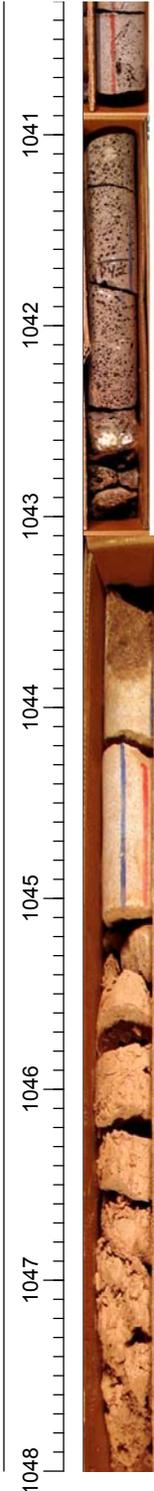
**BASALT:**  
 COLOR: 5YP 4/2 Grayish Red Purple grading to N5 Medium Gray  
 TEXTURE: Aphanitic, diktytaxitic vesicular basalt; vesicular from 1006.0 feet to 1015.0 feet, massive from 1015.0 feet to 1041.0 feet, vesicular from 1041.0 feet to 1042.9 feet  
 COMPOSITION: 35% plagioclase, 10% olivine, 1% pyroxenes, 64% groundmass; plagioclase is submillimeter to rare 1 millimeter laths, olivine is submillimeter to rare 1 millimeter subhedral to euhedral microcrysts and glomerocrysts, pyroxenes are subhedral to euhedral  
 XENOLITHS/AUTOLITHS: Vuggy calcite at 1042.8 feet  
 ALTERATION: N8 Very Light Gray calcite near top, heavy alteration of olivine











SILT AND CLAY:  
COLOR: 5YR 6/4 Light Brown  
TEXTURE: Silt with fines, USCS  
Classification Silt, grains are subrounded  
STRUCTURE: Structureless, massive  
CONSISTENCY: Firm  
CARBONATES: Strongly calcitic  
ROCKS: None noted  
ROOTS/FOSSILS: None noted

