

Unit 15

Continued  
highly olivine-  
augite-phyric  
basalt

Piece 1-3d.

Descriptions  
on previous  
core

No vesicles  
to end of  
Unit 15



3-5 v 1mm straight  
40 → 336

8-18 v 1mm straight 80 → 360

30-52 cm vein 0.1mm straight  
45 → 016

34-36 cm vein 0.3mm straight  
50 → 070

58-61 fracture 60 → 745

63 → 66 vein 0.1mm straight  
82 → 330



77cm v 1.5mm curved 59 → 350

99-103 v 0.5 curved 85 → 630

116-119 v 1mm straight 78 → 334

116.5-119 v 0.6 straight 70 → 210

21-23 cm fracture 75 → 638

UNIT (15)  
(Continued)

highly olivine -  
augite - phyric basalt  
piece 1-2

330-U1376A-13R-2-A\_SHLF2894091\_20110201004043



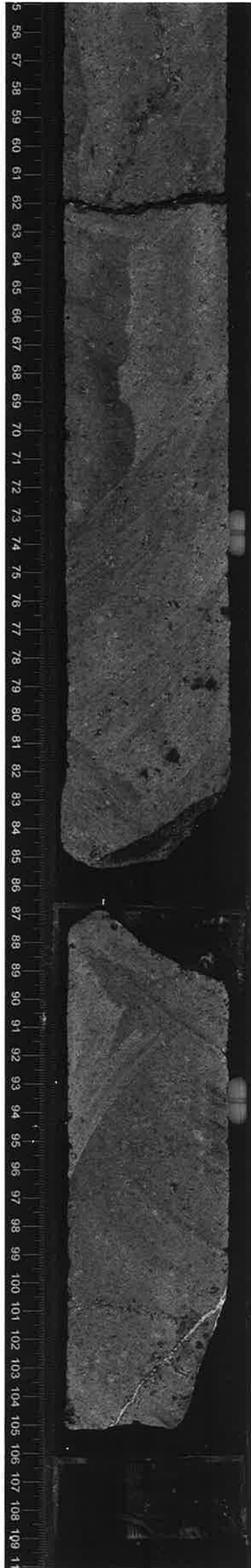
0-1 fracture str 50→344

24 v 0.5mm step 40→253

26.5-32 v 0.2mm step 60→230

31 v 0.4mm str 50→170

31-62 v 0.6mm curved  
75→220



58-62 v 1mm step 30→124

62 v 0.2mm curved 50→290

82-85 v 0.1mm curved 64→330

↑ probably  
same vein

87-90 v 0.4mm curved 60→030

100-105 v 1mm straight 80→126

101 v 0.3mm curve 70→010

101-105 v 0.5mm straight 85→14

330-U1376A-13R-3-A\_SHLF2894121\_20110201004533

UNIT (15)  
(continued)  
highly divine -  
augite-phyric basalt.  
Piece 1-3



0-7V 1.5mm straight 76→285

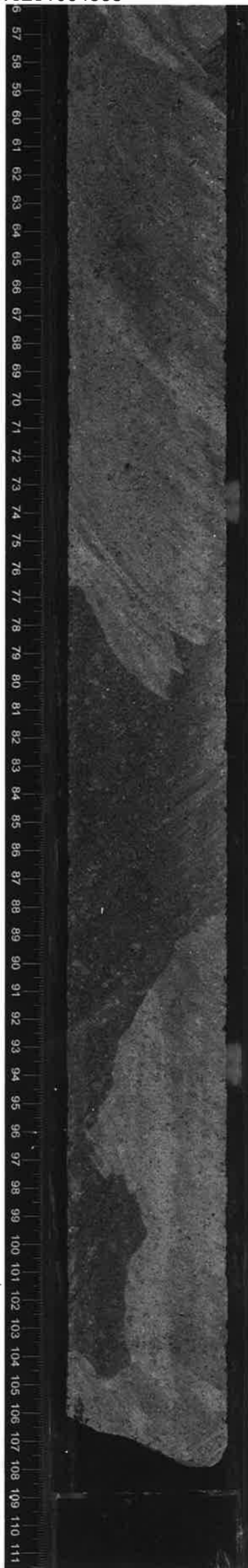
10-13V 0.2mm curved 70→222

31-39V 1mm straight 86→100

40-42V 0.5mm straight 30→20

40-52V 0.3mm curved 80→252

55-56V 0.5mm straight 55→015



85-92V 0.1mm curved 60→220°

106-108V 0.3mm straight 88→202°

UNIT (15)  
 (continued)  
 highly olivine -  
 augite -phyric basalt.  
Piece 1a-1e



15 v 0.1mm stajhr 88→000  
 grading  
 ↓  
 29-32 v 2.6mm stajhr 86→150  
 32.5-41 v 1mm curv 85→060  
 36-40 v 0.5mm stajhr 85→640  
 40-45 v vein network bank  
 n=4 2mm recontn. 85→145  
 58cm igneous contact (no orient)  
 54-57 vein net curv 2mm 90→200  
End of UNIT 15  
Recovered bottom

Color:  
 Dark greenish gray.  
 ↓ 65-67cm v n=1 0.1mm  
 76→350  
 grading -  
 59-91cm baked contact

80-82 v n=1 0.1mm stajhr 85→7340  
 MODERATELY OLIVINE  
 -PHYRIC BASALT CLAST  
Angular CLAST  
 Max; 45 mm  
 Mod; 20 mm  
 PHENOCRYST: OLIVINE-2%  
 MAX: 2mm, MOD: 1mm.  
 - 0.5% - vesicle  
 max 1.5mm, mod; 0.5mm  
 high sphericity, rounded

94-98 v. ntkw n=10 0.1mm  
 78→340  
 possibly some  
 fitting between  
 between pieces  
 104-108 v network n=6 0.1mm  
 68→348

olivine is more  
 altered in the bottom  
 of lava flow.

End of UNIT (15)  
Fractured bottom of lava  
UNIT 16

A little piece of  
 UNIT 15 lava fragment  
 in the top of  
 UNIT 16 (piece 2a)

Hyaloclastite breccia (59cm (13R4A-2a) -  
 (Piece 2a-3b.)

UNIT (16)  
(continued)

hyaloclastic breccia

with clasts up to 22cm  
4mm nodal

mottled dark green  
- brownish gray

100% volcanic clasts

low sphericity

v. angular

glass moderately  
altered in clasts  
totally altered in matrix

Clasts:

moderately  
olivine-  
augite-  
phyric basalt

phenocryst abundance  
varies: typically

5% olivine

1% augite

Olivine:

4mm max.

2mm nodal

subhedral

100% altered in

smaller clasts

fresh in large clasts

Augite:

3mm max

1mm nodal

subhedral, fresh

3 pieces

6-28 vein network,  $n=8$ ,  
max 4mm, mode 0.4mm,  
irregular, in clast

large clast of  
moderately olivine-  
augite phyric basalt

moderately altered

31 vein,  $n=1$ , 0.8mm,  
straight, 70 → 008

40 vein,  $n=1$ , 0.1mm, straight  
80 → 190

42 vein network,  $n=2$ ,  
0.1mm, 75 → 800  
branched

clasts - not all

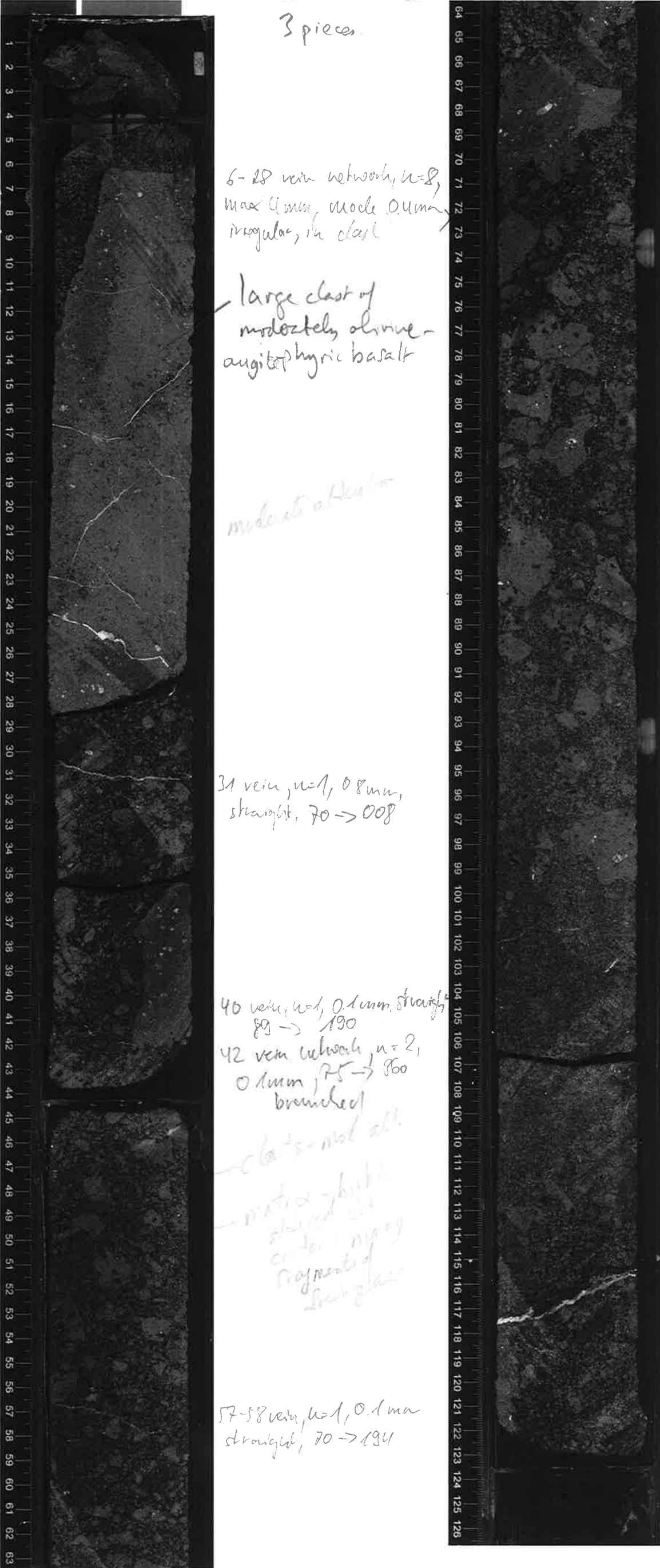
matrix highly  
altered  
contains many  
fragments of  
fresh glass

57-58 vein,  $n=1$ , 0.1mm  
straight, 70 → 194

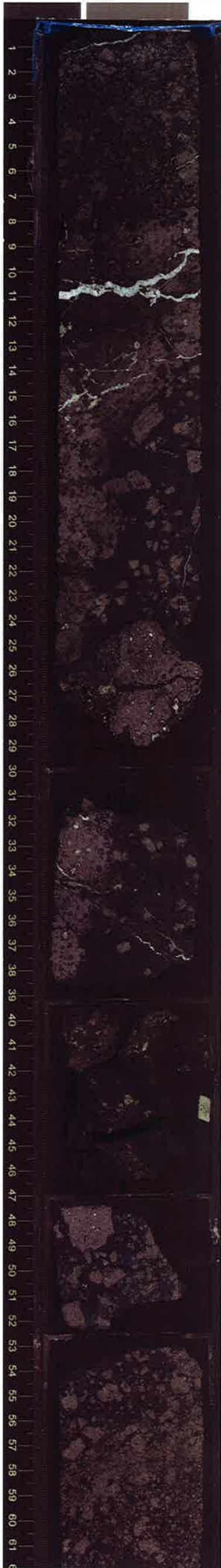
64-89 vein,  $n=1$ , 0.2mm  
irregular, vertical

101-102 vein, 0.2mm,  $n=1$   
stepped, 70 → 353

116-118 vein,  $n=1$ , 2mm,  
55 → 237, branched



Unit (16)  
(continued)



6 pieces  
1 vein,  $n=1$ , 1mm,  
straight, 80 → 165  
3-12 vein  $n=6$   
0.8mm, irreg., sub-rectal

9-11 vein  $n=2$   
3.2mm, branched, 80 → 175  
12-16 vein  $n=12$   
max 1.2mm, max 0.8mm  
71 → 158

21-27 fractured,  $n=13$   
branching  
21-25 vein  $n=6$   
 $n=4$ , 0.1mm, irregular  
26-28 vein,  $n=1$ , 0.3mm  
straight, 86 → 280  
27 vein,  $n=1$ , 1.5mm,  
straight, 73 → 179

0.2mm  
34-38 vein  $n=9$   
branched, 70 → 030

54-56 vein  $n=9$   
0.4mm, straight



66-80 fractured

Configurable  
70-73 vein,  $n=2$ , 1mm,  
irreg. 69 → 202

straight, 69 → 204  
82-84 vein,  $n=1$ , 1mm,  
84-86 vein,  $n=1$ , 1mm, straight,  
65 → 169  
84-86 ign. contact, 1mm, straight,  
69 → 204

Unit (17)

Highly olivine-  
augite-phyric  
basalt.

10% ol. phenos.

2% augite

Fine-grained (0.1mm)

Olivine

6mm max.

2mm modal

subhedral, fresh

augite

6mm max.

2mm modal

subhedral, fresh

Medium gray

No vesicles

Flow lobe?

84-85 fractured, straight

86-100 vein,  $n=1$ , 0.3mm,

straight, 40 → 280

100-102 vein,  $n=1$ , 2mm,

irregular, 80 → 014

103-105 vein,  $n=1$ , 1.5mm

straight, 71 → 020

105-105 vein,  $n=1$ , 2mm,

straight, 62 → 120

103 vein,  $n=1$ , 0.1mm,

straight, 83 → 360

Unit (17)  
(Continued)

Highly olivine-  
angite-phyriz  
basalt.

as in section 2



4 pieces

8-11 vein, w=1, 0.1mm,  
straight, 85 → 156

15-25 vein network, w=2  
2mm, branched, 59 → 72  
branching & reconnected  
17-39 vein, w=1, 0.3mm  
irregular, vertical

slightly  
etched  
much faint  
olivine

45 vein, w=1, 1.5mm,  
straight, 78 → 202

53 vein, w=1, 0.1mm,  
80 → 205 straight

58-65 vein, w=1, 0.5mm,  
straight, 80 → 252



65-66 vein, w=1, 1.5mm,  
straight, 90 → 210

78-84 vein, w=1, 1mm,  
straight, 83 → 312

86-92 vein, w=1, 0.4mm,  
curved, 81 → 204  
87-92 vein, w=1, 2mm,  
straight, 90 → 222  
90.5 vein, w=1, 0.1mm, straight  
61 → 356

93-96 vein, w=1, 0.4mm,  
straight, 56 → 214  
92-97 vein, w=1, straight,  
0.1mm, 80 → 312  
97.5-99 fracture, w=1, curved,  
74 → 216  
100 fracture network, w=2,  
straight, horizontal  
102-107 vein, w=1, 0.1mm  
straight, 90 → 304  
107.5-110 vein, w=1, 1mm  
straight, 80 → 197

110-111 vein, w=1, 0.3mm,  
irregular, straight  
88 348  
113-114 vein network, w=2  
irreg. 0.1mm

Flow fractures at  
base.

112-114 conjugate vein  
network, w=6, 1mm,  
75 → 216, straight

Unit (17)  
(Continued)

Fractured base  
of flow lobe  
as in section 2  
but olivine  
altered.



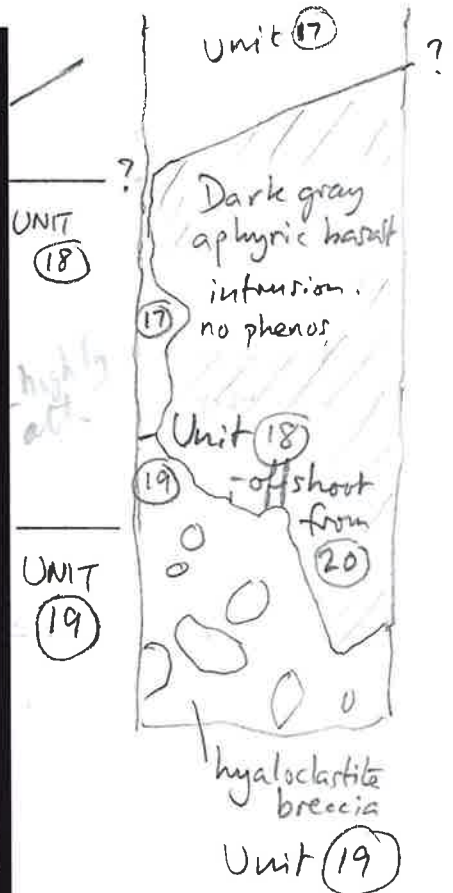
6 pieces

piece

- 8-10 vein, w=1, 1mm, irregular, 78 → 162
- 10 vein, w=1, 1mm, branched, 76 → 350
- 12 vein, w=1, 1mm, branched, 90 → 175
- 15-17 vein, w=1, branched, 10mm, 79 → 160
- 17-21 vein network, w=1, 1mm, irregular, 62 → 318
- 20-21 vein, w=1, 0.5mm, irregular, 81 → 161
- 22-23 vein, w=1, 0.5mm, straight, 80 → 171
- 23-34 vein network, 0.2mm, irregular, w=1
- 31-34 vein, w=1, 6mm, straight, 90 → 142
- 36-32 vein, w=1, 2mm, straight, 80 → 334
- 38-43 vein, w=2, 0.8mm, network, irregular, 80 → 151
- 42-46 vein network, w=2, 0.8mm, irregular, 70 → 159
- 47-49 drilled contact, w=1, straight, 89 → 166
- 46-58 branched, w=2.5, irregular
- 61-65 vein network, w=12, 0.1mm, irreg., in clast.
- 75.5-80 vein, w=1, 0.1mm, irregular, 80 → 036
- 77-82 vein network, 0.1mm, irreg., network, w=7



Nature of contact  
between (17) and (18)  
not clear. Is (17)  
intrusive or extensive?



Hyaloclastite breccia

Moderately  
olivine-phyric basalt  
3% ol.  
olivine in clasts  
4mm max  
1mm nodal  
altered  
Clasts up to 15cm  
in next core  
5mm nodal  
Mottled dark green  
- brownish gray  
100% volcanic  
Glass moderately  
altered.

no augite visible in clasts

Vesicles in Unit (18)

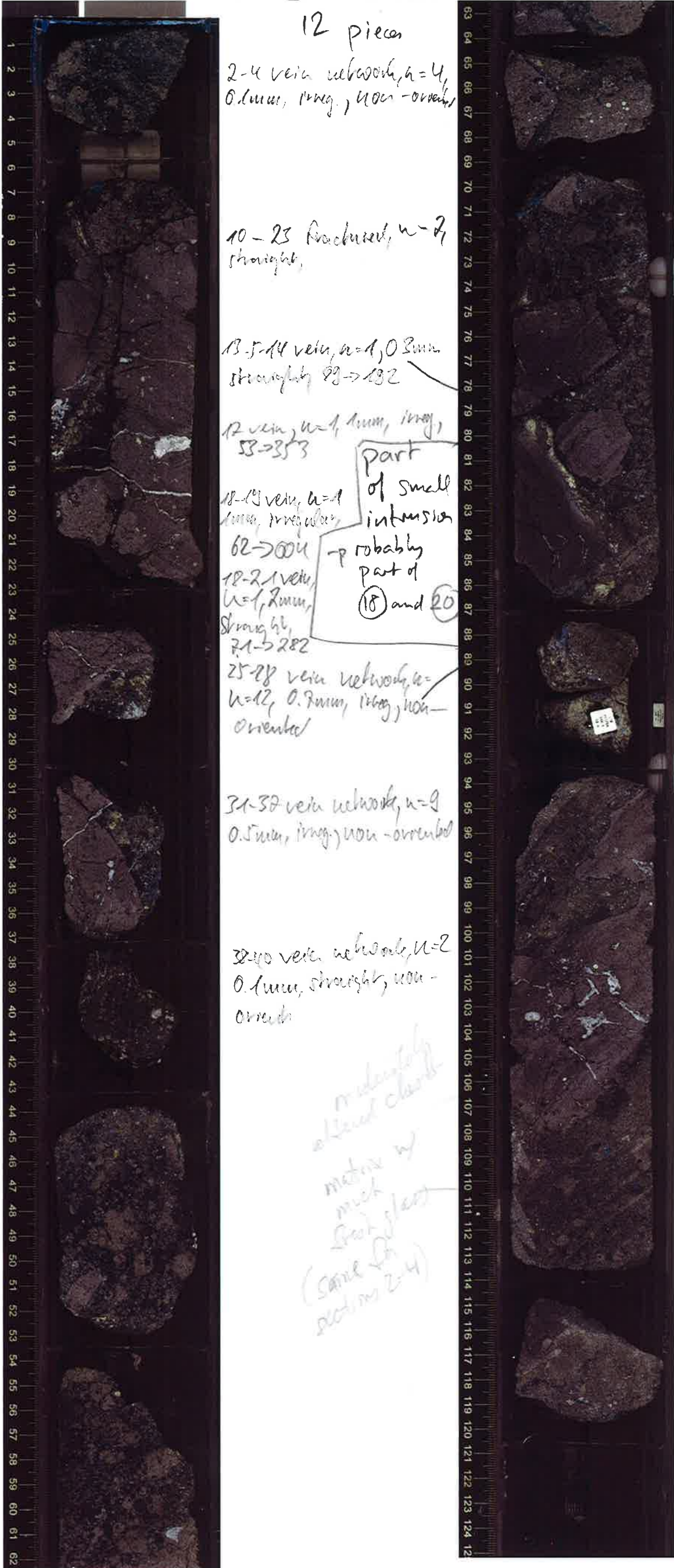
20% in bands parallel to margin  
Max 0.5mm, nodal 0.2mm  
elongate, subangular 100/cm<sup>2</sup>  
100% filled



Unit (19)  
(continued)

hyaloclastite  
breccia

as in 14R-4



12 pieces

2-4 vein network,  $n=4$ ,  
0.1mm, irreg., non-oriented

10-23 fractured,  $n=7$   
straight

13-14 vein,  $n=1$ , 0.3mm  
straightly 89-132

12 vein,  $n=1$ , 1mm, irreg,  
53-353

18-19 vein,  $n=1$   
1mm, irregular

62-004

18-21 vein,  
 $n=1$ , 2mm,  
straight,  
21-5282

25-28 vein network,  $n=$   
 $n=12$ , 0.7mm, irreg., non-

oriented

31-32 vein network,  $n=9$   
0.5mm, irreg., non-oriented

38-40 vein network,  $n=2$   
0.1mm, straight, non-

oriented

moderately  
aligned clasts  
matrix w/  
much  
fresh glass  
(same as  
section 2-4)

25-29 vein network,  $n=4$ ,  
0.1mm, irreg., non-oriented

80-86 vein network,  $n=10$ ,  
max. 1mm, mod. 0.5mm  
curved, parallel in clast?

101-107 vein network,  
 $n=12$ , max. 2mm, mod. 1mm,  
irreg., non in clast

Unit (20)

Aphyric basalt  
intrusive sheet

Dark gray  
fine grains (0.1mm)  
no phenocrysts

Vesicles as in  
Unit (18)

Intrusion  
brecciated  
at margin

4 pieces

3-6 vein network, n=4, 0.1mm  
straight, in clast

mixed with  
overlying  
breccia  
here.

12-14 vein network, n=15,  
0.1mm, irreg., in clast

17-26 vein, n=1, 2mm,  
straight, 89 → 068

21-27 vein, n=1, 0.8mm  
irregular, 80 → 239

21-22 vein, n=1, 0.5mm  
irreg.,  
78 → 151

18-64 vein network  
n=40, 0.1mm, irregular,  
parallel to contact of  
intrusion, branching,  
widely vertical

part of  
margin  
of intrusion

39-40 vein, n=1, 0.1mm  
straight,  
77 → 343

47-56 vein, n=1, Max.  
2mm, wide, 0.2mm,  
straight, irreg. 69 →  
063

59-5 fracture, n=1, straight  
80 → 120

62-63 vein, n=1, 0.2mm, straight  
73 → 166

64 vein, n=1, 0.2mm, irreg.  
70 → 173

65-68 vein, n=1, 0.2mm, curved  
80 → 340

68-71 vein, n=1, 0.2mm, straight  
76 → 152

72-75  
fracture, n=1, 0.1mm, straight  
71 → 163

Piece 2b

Unit (20) Bottom 18 cm

bands of vesicles  
parallel to margin.

Unit (21)

same as Unit (19)

Hyaloclastite  
breccia

75-81 chilled contact  
curved, 10mm,  
sub-vertical

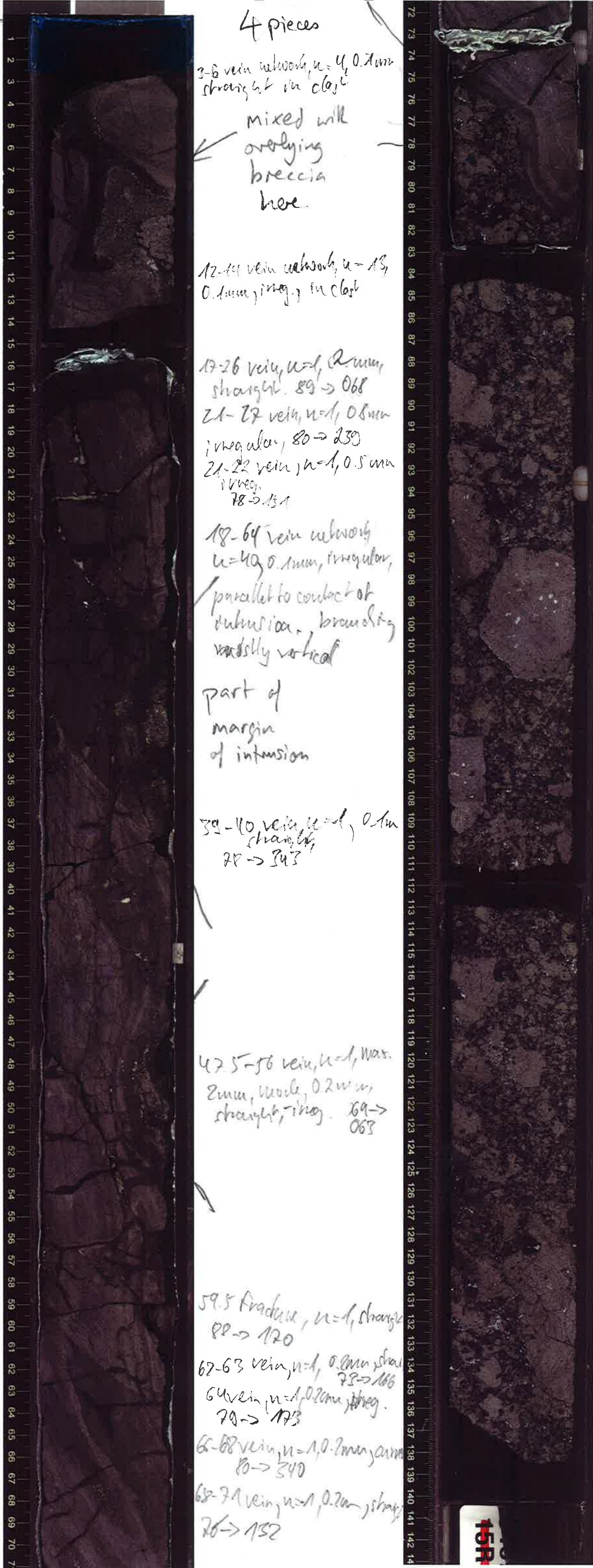
74-80 vesicle band, n=1,  
parallel to contact, sub-  
vertical

95-98 vein, n=1, 0.1mm  
irreg., in clast

101-102 vein network, n=8  
0.1mm, irreg., in clast

116-118 vein net., irreg.  
n=4, 0.1mm, in clast

128-136 vein net., n=9,  
irreg., in clast, 0.1mm-



15R

Unit (21)  
(Continued)

as in Unit (19)

3 pieces



5-12 vein,  $n=1$ , 0.3mm  
straight,

15-25 vein network,  
 $n=2$ , 0.5mm, irregular,  
in clast, 288

33-36 vein network,  $n=2$ ,  
0.2mm, irreg. in clast

40-43 vein network,  $n=1$ ,  
0.1mm, irreg. in clast

51-54 vein,  $n=1$ , 1mm,  
straight, 70 → 110



57-58 vein,  $n=1$ , 1mm,  
straight, 80 → 119  
58-60 vein network,  $n=2$ ,  
0.1mm, irregular,  
57-76 vein,  $n=1$ , 0.1mm,  
straight, 64 → 264

71-76 vein,  $n=1$ , 1mm, straight,  
89 → 048

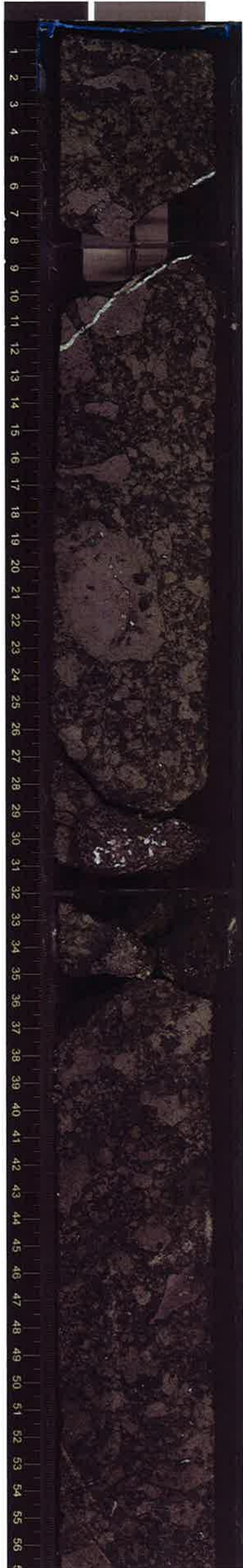
77-80 vein,  $n=1$ , 1mm, straight,  
64 → 224

85-97 vein network,  $n=1$ ,  
0.1mm, irreg., network in clast

89-98 fractured,  $n=1$ ,  
straight

97 vein,  $n=1$ , 0.2mm, straight,  
81 → 711

Unit (21)  
(Continued)  
as in Unit (19)



3 pieces

1-6 vein, w=1, 0.1 mm network, 70 → 119, irreg.

6-8 vein, w=1, 1 mm, straight, 28 → 330

9-12 vein, w=1, 1 mm, straight, 80 → 146



61-81 vein, w=1, 0.1 mm, irregular, 31 → 268

97-101 vein, w=1, 2 mm, (irreg.)  
58 → 154

UNIT 21

Cont'd  
Piec 1-5c

VOLCANIC  
BRECCIA

→ HYALOCLASTITE

30% OLIVINE  
SUBHEDRAL  
PERVASIVELY ALI.  
4mm MAX  
1mm MOD.

MODERATELY  
OLIVINE-PHYRIC  
BASALT BRECCIA

MOTTLED GREEN  
GRAY BLACK.

APHANITIC  
MODERATELY  
ALTERED.

MODERATELY-PHYRIC  
BRECCIATED.

100% VOLCANIC  
CLASTS.

0-59cm  
3mm modal  
LOW  
SUBANGULAR  
MODERATELY-WELL  
SORTED.

59cm - end  
10mm modal  
MODERATELY  
SUBANGULAR  
VERY POOR.

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1-9 vein,  $n=1$ , 4mm,  
51 → 070 straight

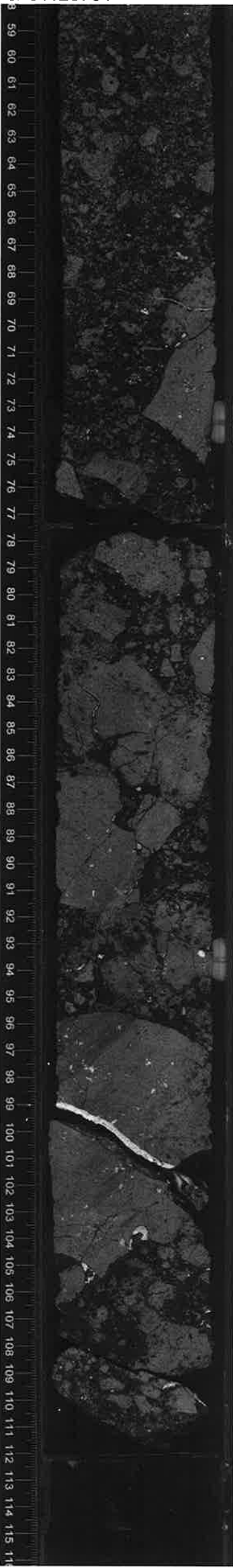
69.5-69  
vein,  $n=1$ , 0.4mm  
irregular, 60 → 009

21-25 vein,  $n=1$ , 4mm,  
irregular, 60 → 034

37-41 vein,  $n=1$ , 3mm,  
straight, 80 → 025

45 vein,  $n=1$ , 2mm,  
irreg., non-oriented

50-56 vein,  $n=1$ , 2mm,  
straight, 113 → 138



VESICLES  
50% ON AVERAGE  
20mm MAX  
1mm MOD  
MODERATE  
ROUNDED.

VESICLES V. VARIABLE  
68-75 vein netw,  $n=4$ , 0.4mm  
irregular

82-92 vein network,  $n=7$ ,  
1mm, mode 0.2mm, straight,  
in clast

Section 1-b  
moderately alk.  
matrix  
w/ altered of fresh  
glass

96-107  
vein network,  $n=8$ , 0.4mm,  
irreg., in clast

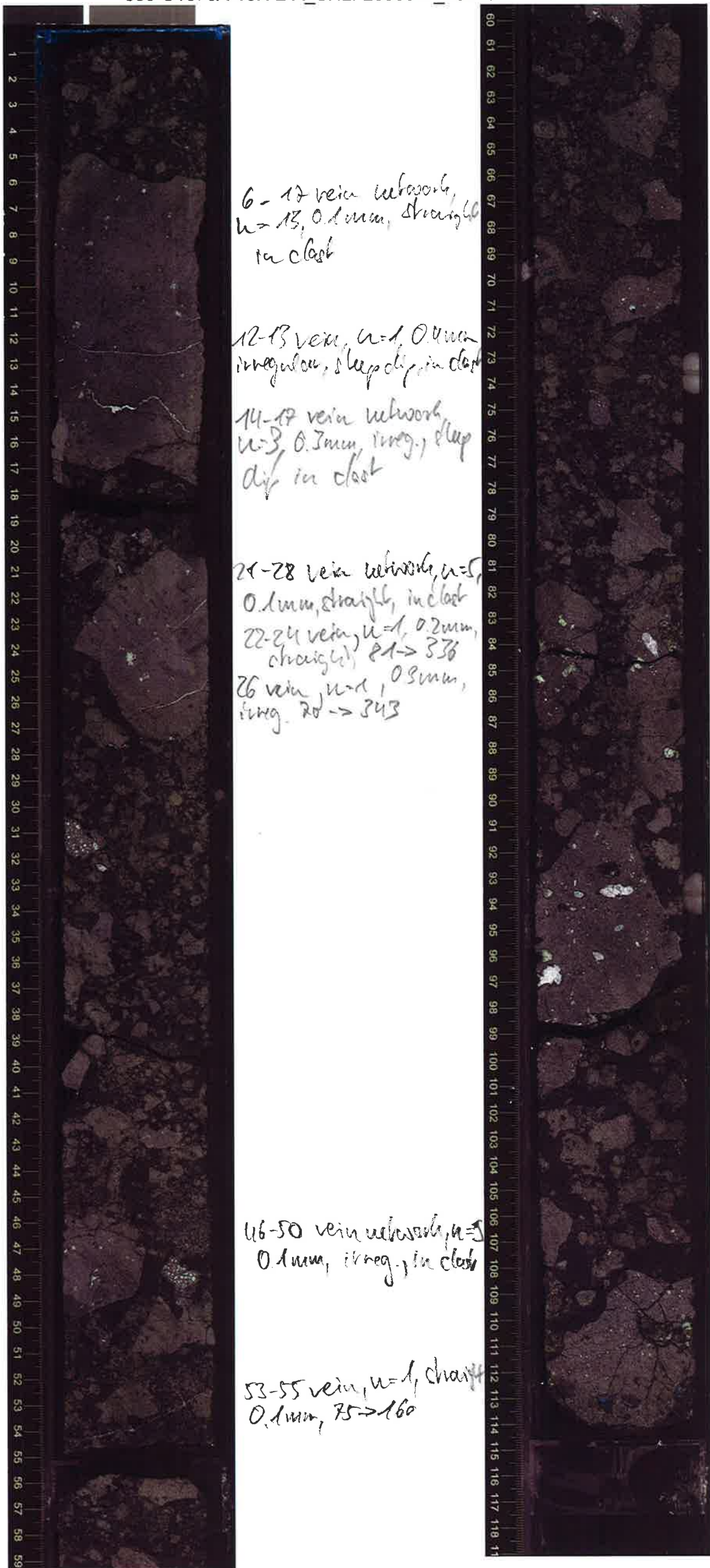
99-101, vein,  $n=1$ , 2mm,  
straight, 71 → 204

UNIT 21

Cont'd

Piece 1 - 2b

330-U1376A-16R-2-A\_SHLF2896011\_20110201130656



6-12 vein network,  
w=13, 0.1mm, straight  
in clast

12-13 vein, w=1, 0.4mm  
irregular, steep dip, in clast

14-17 vein network,  
w=3, 0.3mm, irreg., steep  
dip in clast

21-28 vein network, w=5,  
0.1mm, straight, in clast

22-24 vein, w=1, 0.2mm,  
straight, 21 → 336

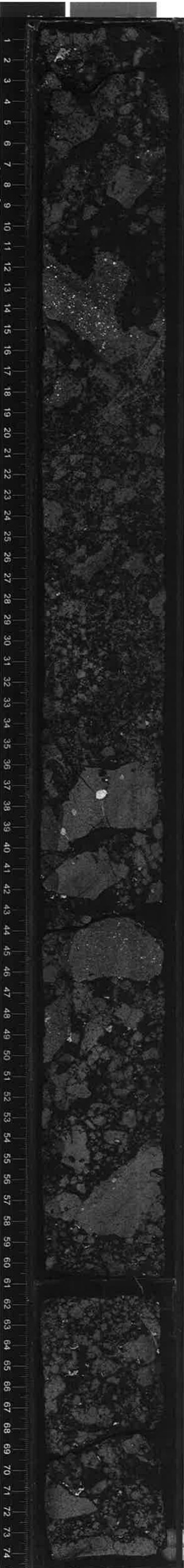
26 vein, w=1, 0.3mm,  
irreg. 26 → 343

46-50 vein network, w=3,  
0.1mm, irreg., in clast

53-55 vein, w=1, straight  
0.1mm, 75 → 160

102-114 broad, w=14,  
network, irregular,  
radial in clast

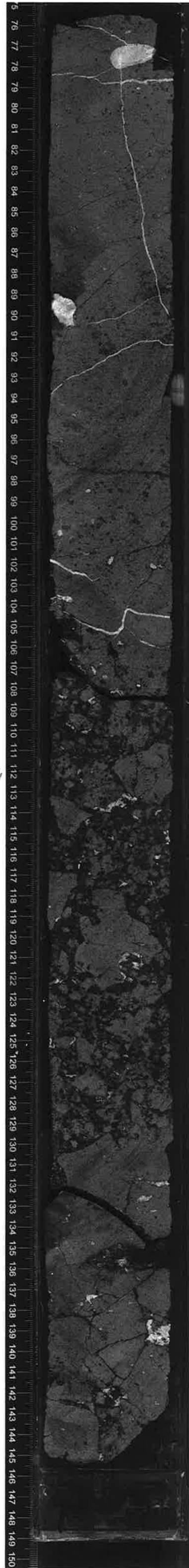
UNIT 21  
Cont'd  
Piece 1 - 3b



1-9 fractured, n=15,  
irregular

10-15  
16-20  
21-25  
26-30  
31-35  
36-40  
41-45  
46-50  
51-55  
56-60  
61-65  
66-70  
71-75

34.5-42 vein network,  
n=7, 0.4mm, irregular,



25-77 vein, n=1, 1mm,  
straight, 90 → 194  
77-91 vein, n=1, 0.8mm,  
straight, 55 → 093

82-85.5 vein, n=1, <sup>0.1mm</sup> irreg., 81 → 156  
80-95 vein network, n=3,  
0.1mm, irregular,

87 vein, n=1, 0.1mm, straight  
75 → 166

90.5 vein, n=1, 0.2mm, straight,  
64 → 165

92-94 vein, n=1, 0.5mm, irreg.

75-108 cm  
CLAST w/  
GLASSY MARGIN  
NO CLEAR  
EVIDENCE FOR  
BEING IN SITU

101-103 vein network, n=7  
max. 1mm, mode 0.3mm, irreg.

96-97 vein, n=1, 0.3mm,  
irregular, 74 → 169

101-105 vein network, n=  
1.5mm max., mode 0.4mm, 12,  
irregular

111-114 vein network, n=4  
0.1mm, irregular, in clast

118-122 vein network, n=4,  
irreg., in clast, 0.1mm

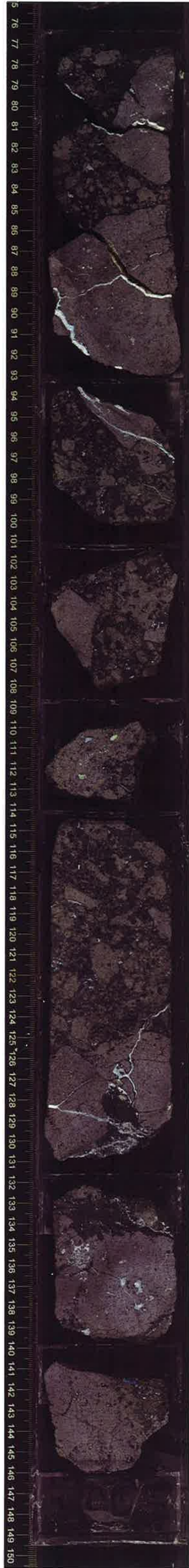
132-145 vein network, n=  
0.3mm, straight, in clast



UNIT -1

Cont'd

Piece 1-8



48-51 vein network,  $\mu=3$ ,  
0.1mm, irreg, in clast

59-68 vein network,  
 $\mu=7$ , 0.6mm, stepped,  
straight, irregular, in clast

79-81 vein,  $\mu=1$ , 1mm,  
curved, 80 $\rightarrow$ 203

85-89 vein,  $\mu=1$ , 1mm,  
curved in clast

88-89.5 vein network,  $\mu=6$   
 $\mu_{max}=0.9$ ,  $\mu_{min}=0.2$ mm,  
irreg, in clast

90-92 vein,  $\mu=1$ , 2mm,  
irregular, in clast

94-96 vein,  $\mu=1$ , 2mm,  
irregular, in clast

95-97 vein,  $\mu=2$ , 1mm,  
branched, 80 $\rightarrow$ 220

99 vein,  $\mu=1$ , 88 $\rightarrow$ 216,  
straight, 0.1mm

103-106 vein,  $\mu=1$ , 0.1mm  
irregular,

110-113 vein,  $\mu=1$ , 0.1mm,  
irregular, non-ornate

115-122 vein,  $\mu=1$ , 0.1mm,  
straight, 63 $\rightarrow$ 269

124-129 vein,  $\mu=1$ , 1mm,  
irregular, 24 $\rightarrow$ 295

132-134 vein network,  
- 1.5mm,  $\mu=3$ , branched  
85 $\rightarrow$ 193

← LOBATE &  
FLUIDAL  
TEXTURE  
→ IN SITU?  
~134 cm.

133-139 vein network,  
 $\mu=10$ , 0.2mm, irregular

142-146 vein network,  $\mu=4$   
0.1mm, straight, non-  
ornate



UNIT 21  
 CONTD  
 PIECE 1-56

100% VOLCANIC  
 CLASTS

4mm mod  
 Moderate  
 Subangular  
 Poor

70% vesicles  
 14mm max  
 1mm mod  
 high  
 rounded:



15-18 vein network,  $n=3$   
 0.2mm, ~~to~~ irregular,  
 88 → 159  
 17-18 vein,  $n=1$ , 0.5mm  
 straight 85 → 179

26-28 vein network,  
 $n=3$ , max 2mm, mod  
 0.5mm, irreg., in clast

34-39 vein network,  
 $n=3$ , 0.3mm, irregular  
 branched, 69 → 204

55-62.5 vein,  $n=1$ , 1.8mm  
 branched, straight,  $n=$   
 136



81-85 vein,  $n=1$ , 0.2mm,  
 straight, 60 → 023

98-102 vein,  $n=1$ , 0.5mm  
 irregular, 72 → 217

103-110 vein network,  $n=11$ ,  
 0.3mm, branching & re-connect,  
 76 → 211

103.5-106 vein,  $n=1$ , 2mm,  
 straight, 63 → 198

104-107 vein,  $n=1$ , 2mm,  
 straight, 60 → 206

118-119 vein,  $n=1$ , 0.2mm,  
 curved, 82 → 003