

| BOX # | Interval | 90° = vertic FRACTURES | Graphic Symbol | unit interval | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|---------------|--|-------------------|------------------|--|---------------------|
| 1 | 453 - 463 | v. few 75° w/ slight 0°, 25°, 70° random. | | 453' - 512' | Basaltic andesite med. grey, coarsely porphyritic Plag phenos ≤ 7 mm; olivine phenos \ll plag FeOx, limonite on fractures v. finely disseminated metallic mineral these crystals showed alteration \rightarrow bluish metallic and brown-tarnish; also lack of striations ((Copper?, Pyroxene?)) These were ≤ 2 mm in size. non vesicular | -15% |
| 2 | 463 - 471.5 | no fractures | | | Same except disseminated metal min. v. rare | |
| 3 | 471.5 - 480.5 | 0°, 55° v. few 65° | | | Same; FeOx coating on 0° fract. dissemin. olivine pheno slightly larger (≤ 3 mm) | |
| 4 | 480.5 - 490 | none | | | much FeOx, v. small flakes of "tarnished" metallic flakes \rightarrow (blue metallic flakes) also brass yellow w. flakes (Cu?) not present in pyroxene on this box | |
| 5 | 490 - 499 | 70° minor fracturing 50° random | | | FeOx on fractures, many finely dissemin Some; metallic flakes | |
| 6 | 499 - 509 | minor 60° 75° | | | vesicular for $\frac{1}{2}$ 2-3' - vesicles open ≤ 4 mm disseminate metallic flakes still present slight FeOx on fractures Sharp contact | |
| 7 | 509 - 521 | unconsolid. | | 512' - 705' | cinder ash agglomerate - Top 7' mostly cinders w/ Plag. phenocr. red ash and ash | |
| 8 | 521 - 536 | unconsolid | | | agglomerate - various lapilli - yellow color no phenos - crude grading, poorly indurated lapilli: 2mm \rightarrow 1cm - are vesicular - appeared to fall in solid form | overall oxidat.) |
| 9 | 536 - 545 | unconsolid | | | Lapilli 2 - 5cm; increase in FeOx v. rare disseminated met. flakes | |
| 10 | 545 - 555 | unconsolid | | | cinders/ash v. vesicular, few lapilli red/ash color | |
| 11 | 555 - 565 | " | | | less consolidated than previous boxes | |
| 12 | 565 - 575 | " | | | totally unconsolidated vesicular lapilli of size 17mm - 20mm | |
| 13 | 575 - 591 | " | | | same | |
| 14 | 591 - 605 | " | | | same | |
| 15 | 605 - 616 | " | | | still unconsol. but lapilli are more homogen, as if parent rock was vesicular basalt. dk gray no phenos. v. rare disseminated metallic mineral - blue-tarnished Cu?, pyroxene? and/or altered olivine? | |
| 16 | 616 - 628 | " | | | same | |
| 17 | 628 - 644 | " | | | same v. fine, v. rare disseminated metallic mineral | |
| 18 | 644 - 654 | " | | | same increase in FeOx | |

CORE LOG

PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____

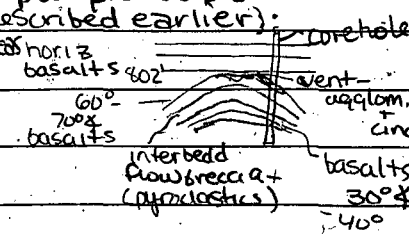
WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 7-27-87 PAGE 2

| BOX # | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|--------------|-----------------------------------|----------------|-----------------------------------|---|
| | | | | Unit Interval | Lithology - Description |
| 19 | 654 - 664 | unconsolid | | 512' - 705' (cont. from pg. 1) | <u>Cinder ash agglomerate</u> lapilli ≤ 5 mm - rounded |
| 20 | 664 - 673 | " | | | decrease in lapilli size (< 1 mm) increase in vesicularity - vesicles open |
| | | | | | v. rare, v. fine disseminated metallic flakes tarnished blue + green, minor clay, possible FeOx stain. |
| 21 | 673 - 687.5 | " | | | increase in red color - mostly ash less vesicular |
| 22 | 687.5 - 704 | " | | | red ash/cinders, mostly fine grained w/ few lapilli ($\approx 1-2$ mm) some vesicularity |
| | | | | | oxidation w/ some v. rare, v. fine disseminated copper. |
| 23 | 704 - 712 | mod 50°-85° random | | 705' - 716.5' | <u>Basaltic Andesite</u> mod. porphy. with strongly oxidized groundmass; 5% pheno - plag ≤ 2 mm, olivine ≤ 1 mm; minor slightly vesicular - vesicles ≤ 2 cm open and usually elongate gradational contact w/ above cinders + ash |
| | | | | | Fracture have much red oxidation disseminated Cu flakes + tarnished Cu flakes present flakes ≈ 1 mm throughout core |
| 24 | 712 - 722 | minor 60° most of box unconsolid. | | 716.5 - 732' | <u>Cinder ash airfall deposit</u> sharp contact 1st 10' deep red oxidized color. Mostly unconsolidated no apparent grading grain size - uniformly fine to med grain size |
| 25 | 722 - 732 | unconsolid. | | | fine lapilli, v. rare plag crystals ($< 10\%$) last 5' darker red/brown gray |
| | | | | | same v. fine (microscopic) disseminated vitreous clasts (finer than before) |
| 26 | 732 - 742 | few 70° strong 90° (parallel) | | 732' - 749' | <u>Basaltic Andesite</u> similar to B-A interval 705' - 716.5' except oxidation is not as extensive; i.e. fresh fractures are med gray color with little FeOx stain, slab fracturing is more extensive least a' increase in vesicles (≤ 3 cm) open + horiz. elongated |
| | | | | | (Oxidation on fractures more sericite minor clay on fractures) |
| 27 | 742 - 751 | strong parallel 90°, few 80° | | 749' - 762.5' | <u>Basalt flow</u> v. very vesicular mod. porphy. Olivine basalt w/ $\leq 5\%$ phenos. groundmass significantly less altered than before. Med gray reddish color. Most vesicles open - few have minor clay ≤ 5 cm. |
| | | | | | sharp contact - top appears to be less consolidated than rest of flow |
| 28 | 751 - 769 | few 30°/40° ash-uncons. | | 762.5 - 768 | <u>unconsolidated ash to white lapilli tuff</u> airfall deposit - v. fine grained |
| | | | | 768 - 802 | <u>Basalt Flow</u> very fine grained aphanitic first 14' highly vesicular - vesicles ≤ 3 cm, open, sharp contact w/ above ash dark grey color |
| 29 | 769 - 779 | minor - few 50°, 90° | | | Slight clay v. fine abundant shiny vitreous flakes in vesicles sericite slight oxidat. |
| 30 | 779 - 789 | v. few 45°, 70° | | | non vesicular, dense, med grey little alteration. |
| | | | | | minor clay on fractures |

CORE LOG

PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____
 WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 7-28-87 PAGE 3

| BOX # | unit interval | FRACTURES & ALTERATION | Graphic Symbol | GEOLOGIC DESCRIPTIONS | CORE SIZE Drilling Fluid Samples |
|-------|---------------|--|----------------|--|--|
| 31 | 789-797 | mod 0° (horiz.) | | 768-802' Basalt Flow (cont) same except near base of interval groundmass is slightly oxidized. slightly vesicular, vesicles elongated & horizontal | slight alter. v. fine dissem. ferrite minor clay on fract |
| 32 | 797-807 | mod 0°-30° in basalt most unconsolid. | | 802'-805' Flow breccias + agglomerates top foot flow breccia, remainder loosely consolidated deposit w/ lapilli - < 1cm. This zone is highly oxidized with bright orange FeOx on all surfaces. Some vesicular unconsolid blocks (pieces of volcanic vent?) Flow \approx 60° (assumed core is 90°) in breccia. Angular unconformity between this section + above basalts - weathered, disrupted contact. | pyroclastic |
| 33 | 807-816 | random 0°, 50°, 30°, 90° mod 90° to most abundant fracture (in B-A only) cinders were unconsolid. | | 805-810.5 Basaltic Andesite flow - fine grained sparsely porphyritic < 1% plag phenos obvious flow angles - \approx 60°-70° *** note - above basalts - horiz; definite flow angle present in this unit 810.5-812 cinders + agglomerates - loosely consolidated, unsorted, lapilli and blocks of varied lithology: (some vesicular, some dense) This appears to be part of a volcanic cone i.e. conical hill of lava + pyroclastics built up around a volcanic vent | disseminate flakes of previous flows absent slight oxid. stain. red FeOx on cinders |
| 34 | 816-826 | 816-821' strong 90° fractures mod 6°-35° 821- rest of box fracture \approx decreased to 0°-40° mod. | | 812-862 Basaltic Andesite flow - v. fine sparsely porphyritic (< 1% plag) 60°-75° flow angles in top 6-10' - vesicular with open vesicles aligned & elongated in flow direction. 816-821 more fractured than rest of box - clay (calcitic?) on fractures (yellowish) - extensive FeOx and/or hematite earthy textured mineral in this fracture area also. (altered groundmass) susceptibility decrease for this interval (prob. caused by extensive alteration) at 821' the basalt becomes non vesicular, dense & dark grey, with mottled appearance. Occasional xenoliths of 4-5 cm porphyritic vesicular basalt with 15% plag phenocrysts | clay / FeOx on fractures brown/red alteration on fractures (appears to be groundmass alteration) possible sulfur(?) on fractures |
| 35 | 826-836 | strong fract. on 0°-45° (appears to follow flow lines) several parallel 40° fract (flow \approx is \approx 40° also) | | Flow \approx not as steep as previous (indicates volcanic cone as described earlier): non vesicular decol. horiz in phenos (<< 1%) they are small (2-4mm) vesicles | brown/red FeOx on fractures is very hard and porphyritic (crystals too small for hand lens i.d.) |



PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____WELL HEAD ELEV. _____ LOGGED BY ML DATE 7-29-87 PAGE 4

| BOX # | unit interval | FRACTURES & ALTERATION | Graphic Symbol | GEOLOGIC DESCRIPTIONS | CORE SIZE Drilling Fluid Samples |
|-------|---------------|--|----------------|--|---|
| 36 | 836 - 845 | mod 0°-15° ^{parallel} (The basalt before & after is much more fractured.) | | 812' - 862' Basaltic Andesite (cont) fractures appears to follow flow lines (as before) flow % & 150 (steadily decreasing) non vesicular | FeO _x (red & orange) on fractures blue rounded white accretion on fract. & vugs. |
| 37 | 845 - 855 | intense parallel 0°-5° & frac. "platy look" parallel to flow & The fracturing gets extreme at ± 450' to 462' (end of unit) | | same except increasing mottled appearance and alteration/fracturing give basalt appearance of fissility The last 7' of unit have extensive low % fractures & alteration - alteration appears to follow flow lines. (Even in unbroken portions of core) | increased oxidation of groundmass - fractures highly altered. limonite hem. on fract. also |
| 38 | 855 - 864 | same as Box 37 in Basalts | | 862' - 892' volcaniclastic - interbedded lithic crystal tuffs and agglomerates 862'-863' contact appears to be disrupted - top foot appears that basalt flowed over this section and took pieces with (at flow % of 0 to 20% deep dark red oxidation at contact. | highly oxidized deep red vitric disseminated metallic plates |
| 39 | 864' - 874' | mostly uncons. random frac minor in consolidated parts | | 863' - 866' Crystal lithic tuff - lithics - 1mm - 3cm all appear to be basalt crystals < 1mm, < 1% plaq. vesicles usually small (< 1mm) 866' - 871' agglomerate/cinders - unconsolidated deep orange color, lithics + cinders range in size from 1mm to 5 cm. 866'-869' has vitric pieces included in agglomerates, (usually 1-2mm & < 1%) | 863-866 deep red Ox 865-872 vit. rare, v. fine silver or tenuous plates (seriate) deep oxidation |
| 40 | 874' - 883' | most of box unconsolidated | | 871' - 872.5 Crystal lithic vitric tuff - lithics 1mm - 1cm, crystals plaq. < 1% (< 3mm) vitric glass < 1%, ash matrix - deep orange oxidation color, cinders + 872.5 - 892' Volcanic breccia/agglomerates - reddish purple color - extensive alteration of groundmass, vesicular basaltic blocks up to 10cm. - coarsely porphyritic w/ Plaq crystals ± 15% ~ < 3mm in size | limonite on fractures rare metallic minerals, somewhat crushed (Cu?) |
| 41 | 883' - 894' | most of box unconsol. a broken up | | The last 2' of this interval appears to be a highly vesicular crystal tuff. The crystals are plaq. < 2mm ~ 15%. The groundmass is highly altered | light clay in vesicles |
| 42 | 894' - 903 | random - strongest are at 80°-90° agglomerate is unconsol. | | Basalt top flow - scoria flow breccia coarsely porphyr. - plaq 15-20% lg. crystals < 4mm Some clasts vesicular, some dense & dk grey - blocks up to 7cm long groundmass highly altered, cinders & ash. 894.5 - 897' - agglomerate - unconsolidated | clay on fract. much FeO _x on fract; very fine (microsc) disseminate plates (seriate) |
| 43 | 903' - 916' | flow breccia mod. 90° transition between flow breccia & basalt highly broken up | | 902'-905' - "pink" groundmass with few blades increased oxidation 905' - 910' transitional - gradational contact between flow brecc. + basalt | obvious Cu clays on transition between two and below basalt |

CORE LOG

PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____

WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 7-30-87 PAGE 5

| BOX # | unit interval | FRACTURES & ALTERATION | Graphic Symbol | GEOLOGIC DESCRIPTIONS | CORE SIZE Drilling Fluid Samples |
|--------------|----------------|---|----------------|--|--|
| 43 (cont) | 903'- 916' | v. few fractures mnr. 50° mnr. 0° | | 916' - 974' <u>Basaltic Andesite</u> : flow & s horiz coarsely porphyritic - 10% pheno s of plag (< 4mm) >> olivine (< 3mm) "laminations" in flow (1/2 cm thick) apparent, non vesicular, v. dense med grey. | rare metallic flakes - tarnished (1/2 mm) minor alter. hematite/limonite on 0° fract. |
| 44 | 916'- 927' | mod 50-70° clay on frac 0° frac w/o clay | | same | olivine cryst. have been hydrotherm. altered - blue & copper colored metall. & min on both fresh & altered frac |
| 45 | 927'- 936' | mod 50° parallel frac 927'-930' mnr 90°, 0° remainder of box | | same | v. rare tarnished metallic flakes + altered olivine phenocr. v. mnr. alter-clay on frac. frac generally looks fresh |
| 46 | 936'- 945' | 155°, 165°, 175° fract w/ strong alter. mod 0° frac throughout box | | same - flow lines are slightly visible appear to be ~ 50° (parallel to fractures) occasional slightly vesicular xenolith | clay + v. fine disseminated sericite on weathered 0° fract minor Fe Ox Oliv. still altered |
| 47 | 945'- 955.0 | 0° & 50° moderate | | matrix appears to be v. slightly altered | |
| 48 | 955'- 964' | 962-964 highly altered extensive 90° fracture mod 0°-40° | | same | |
| 49 | 964'- 974' | Extensive horiz frac. from 968-970' parallel mod 0° frac rest. | | flow & decreasing ~ 20° - 0° flow banded. | much clay/FeOx on fract. clay is on parallel flow lines - apparent fissility |
| 50 | 974'- 985' | most of box unconsolid. | | 974' - 978' Top flow breccia: contact between basalts and pyroclastics flow & 80°(?) mod. porphr. w/ 5% plag phenocr. basaltic blocks ≤ 7cm oxidized groundmass slightly vesicular | |
| | | | | 978 - 980 Litic crystal tuff red oxid matrix plag crystals < 1% vesicular blocks (vesicles < 1mm) | |
| 51 | 985'- 995' | broken up unconsolid- random frac. | | 980 - 989 Flow breccia: highly broken up - < 1% plag crystals (< 1mm) clasts appear to be basalt | |
| | | | | 989 - 992 agglomerate - red ash matrix with weak to to set consolidated basaltic clasts mod (< 5cm) | |

CORE LOG

PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____
 WELL HEAD ELEV. _____ LOGGED BY M. Lemeup DATE 7-30-87 PAGE 6

| BOX # | unit interval | FRACTURES & ALTERATION | Graphic Symbol | GEOLOGIC DESCRIPTIONS | CORE SIZE Drilling Fluid Samples |
|-------|---------------|---|----------------|--|--|
| 51 | (cont) | unconsolid. broken up | | 992-994 Breccia flow or volcanic breccia darker gray w/ reddish FeOx oxidation highly vesicular (vesicles < 3mm) | limonite, FeO _x |
| 52 | 995' - 1005' | unconsolid. | | 994-1002 lithic tuff 1st foot is lithic crystal tuff (< 10% v. small plag xls) then tuff become highly vesicular with no crystals, vesicles are open vesicle size 1mm to 2cm - broken up in many place - lithics appear to be vesicular basalt. | highly oxidized grnd mass |
| 53 | 1005' - 1015' | random mod 30°, 50°, 70°, 90° | | 1002' - 1014' Breccia Flow dense, lt. pink to red (due to extensive alter. of grnd mass) rare tubular plag crystals (< 1%) basaltic portions have finely disseminated metallic flakes | large vugs w/ FeOx, limon, + lt. blue clay + other alter on fract |
| 54 | 1015' - 1024' | fractures follow flows, 0°, 30°, 50°, 90° mod | | 1014' - ? Basaltic Andesite very fine grained, sparsely porphyritic (plag < 1mm < 10%) flow banding varies from 20° - 60°, fracturing appears to follow flows. Slightly vesicular - vesicles appear to line up parallel to flow bands - elongated + open dense med grey | mr clay on fractures mr FeO _x stain |
| 55 | 1024 - 1034.5 | missing | | 1024' - 1034.5 No sample mostly | |
| 56 | 1034.5 - 1047 | mostly unconsol. + bro con | | ? - 1043 crystal lithic tuff + unconsolidated ash/andres → top 6' strongly red oxidized, poorly consolidated lithics < 5% < 5mm prob. basalt crystals - plag < 10% - vent material more consolidated with increase in sulfur (cement?) as a "sulfur zone" is entered that continues into next lithol. decrease in crystals, increase in lithics (~15%) last 1/2 water laid | much FeO _x oxidat |
| | | | | 1044-1043 volcanic andesite (?) uniform, rounded, med sized grains of Qtz, K-spar and volcanic lithics cemented by limonite or sulfur among | Sulfur (?) |
| | | more - very crumbly (loosely consolid.) | | Crude Grading is present. This appears to be some kind of water deposit | |
| 57 | 1047' - 1056' | mod 0° few 30°, 90° | | 1045' - Basaltic Andesite: coarsely porphyr. plag phenos ~ 30%, < 5mm; oliv. ~ 1% < 3mm pyrox (?) < 10% top 6 feet contains extensive alteration in the form of sulfur (?) and/or limonite (very yellow - effecting ground mass, this slowly fades out @ 1052') | mr. white clay in vesicles abundant microsc. & disseminated sericite? in vesicles, olivine alters to metallic tarnished mineral (?) mr. FeO _x stain on fractures |
| | | | | 1045' - 1057' lapilli tuff composed of basalt frags vesicles open - range in size 1mm - 4cm highly vesicular (possibly crust of lava flow?) | |

CORE LOG

PROJECT Cascades drilling

WELL NUMBER Geo N-3

LOCATION _____

WELL HEAD ELEV. _____

LOGGED BY M. Lemieux

DATE 7-30-87

PAGE 7

| BOX # | unit interval | FRACTURES & ALTERATION | Graphic Symbol | GEOLOGIC DESCRIPTIONS | CORE SIZE Drilling Fluid Samples |
|-------|---------------|--|----------------|---|---|
| 58 | 1056 - 1065 | mod 0° | | 1045' - 1057' - 1071' <u>Basaltic Andesite (cont)</u> non vesicular - much more dense med grey color. | mnr. FeO v. mnr. clay on fract. ultra shiny flake present in much lower propor. than vesicular section Olivine not |
| 59 | 1065' - 1080' | mod 0° 1066 - 1048 mnr 70° w/ FeO | | 1071' - 1087' highly vesicular (as before) 1071' - 1073' appears to be loosely consol. agglomerate (composed of varied size basaltic lithics) possible vent material | mnr lt blue/white clay in vesicle v. fine sericite flakes in vesicle (as before) FeO oxide |
| 60 | 1080 - 1090.5 | 1078' - 1080' highly broken up & fractured 1090 - 1091 - broken up | | 1087' - 1088' decrease in vesicularity, vesicles that are present elongated & aligned in flow direction. $\approx 20^\circ$ | FeO oxide |
| 61 | 1090.5 - 1101 | 0°, 30° mod 90° fract. highly altered random | | 1090 - 1091 - highly altered ground mass FeO +/- uraninite (?) filling vesicles & on fractures | on fractures alter. of olivine Kfs + |
| | | | | 1091 - 1099 - little alteration in vesicles } indicates flows 1099 - 1101 - highly altered vesicles } amt of vesicles is changing every foot. } interbedded | (needle like acicular Kfs (white, transp)) |
| | | | | | Gypsum? anhyd? (v. rare) |

CORE LOG

PROJECT Cascades drilling

WELL NUMBER Geo N-3

LOCATION _____

WELL HEAD ELEV. _____

LOGGED BY M. Umievs

DATE 8-1-87

PAGE 8

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|---------------|--|--|--|---|
| 62 | 1101 - 1110 | mod 90° few 75° mod 0° | | same - vesicular 1101-1103' (also fract) nonvesicular sections dont appear to have any alteration - (1103'-1109') 1109-1110 - intense alterat (vesicular again & broken up) | altered oliv. vesicles filled with sand (?) rounded Qtz grains? on fractures also FeOx/limonite clay/sand in vesicles + on fract. abund. v. fine sericite in vesicles ft. clay coating on vesicles |
| 63 | 1110 - 1126.5 | random, fract + broken up - especially in red oxidized basalt. | | 1115' - 1130' 1115' change to reddish highly oxidized, vesicular flow. vesicles elongated vertically (< 6 cm) - coarsely porphyr. plag. appear to be slightly altered | FeOx/limonite clay/sand in vesicles + on fract. abund. v. fine sericite in vesicles ft. clay coating on vesicles |
| 64 | 1126.5 - 1138 | top 4' broken up then mnr. 90° mod 0° - 30° | P | vesicular to 1132' then dense med grey. with little or no alteration | least 2 feet, olivine is still altered (even in dense grey rock) |
| 65 | 1138 - 1149.5 | mnr 90° mod 0° 1144 - broken up | | same flow - dense med grey to 1144' then flow becomes broken up + highly altered | FeOx limonite Extensive filling vesicles, fract |
| 66 | 1149.5 - 1160 | 1149 - 1153 broken up 1153 - 1160 mod 0 - 30° | | 1149' - 1153' broken up + highly altered 1157' - vesicularity increases - vesicles elongated and aligned at flow & ~35° | clay/FeOp ft clay in vesicles |
| 67 | 1160' - 1169 | mod 0 - 30° | | vesicular to 1163' - then very dense plag crystal decrease ~10% olivine - << 1% phy. << 1% (?) | alteration decrease disem. cryst. in vesicles rare acicular radiating xls little or no alter. on fract |
| 68 | 1169' - 1180' | few 40° - mod 90° - last | | 1176' - 1194' highly altered and broken up Basalt flow purpled oxid. basalt with yellowish clay grading into deep red completely oxidized vesicular unit, in turn grading into tan altered unit. | extensive FeOx, limonite & clay on all surface including grndmass oxidation |
| 69 | 1180' - 1190' | 4' extensively broken up all of Box 69' broken up | one flow top 18' highly altered | This is a collection of highly altered basaltic blocks - at one time appears this was solid flow; highly vesicular | |
| 70 | 1196 - 1199 | broken up to 1194' mod - strong 0° - 30° | | 1194 - 1248 Basaltic Andeste - sparsely porph. Plag << P highly vesicular; med grey to red/grey (slightly oxid. grndmass) vesicles both open & filled - upto 4cm in size; no apparent orientation with regard to flow & ls | much alter. on frags ft. white clay coating vesicles disem. sericite plates in vesicle |
| 71 | 1199 - 1208 | mod 0°, 35° 1204' - end of box highly fract. at random & ls | | same, except grndmass in increasingly oxidized | calcite clay on fract in highly fract area |

CORE LOG

PROJECT Cascades drilling WELL NUMBER Geo N-3 LOCATION _____

WELL HEAD ELEV. _____ LOGGED BY ML DATE 8-3-87 PAGE 9

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|---------------|--|----------------|--|---|
| 72 | 1208 - 1217 | entire box randomly frac. in all direct. 60-30° most promin | | same; plag << 10% pyroxene(?) ^{or} (altered olivine?) << 1% ≤ 2mm still vesicular; lt clay in vesicles | groundmass not oxidized like previous flow |
| | | | | intra flow breccia brown-grey | all fract. slight altered - mnr FeOy |
| 73 | 1217 - 1228 | 1217-1224.5 broken up 1224.5-1225 mnr. 40° | | 1217-1224' highly altered; highly fractured; appears to be weathered contact between 2 flows - the vesicles are filled with volcanic sand - sub rounded to subangular, poorly sorted of varying lithol. 1223'-1224' appears to be loosely consoli. agglomerate of volcanic debris. 1224'-1230' med grey, vesicular basalt; sparsely porph; plag, oliv pyrox << 10% vesicles elongated + aligned in flow direction (330°) with lt. blue clay coating | much clay + sand washed in. mnr. FeOy |
| 74 | 1228' - 1240' | 1230'-1236' broken up + random fract 236'-1240' mod. random 30°-80° | | intra flow breccia purplish-brown 1230' - 1236' highly fract., highly altered, v. vesicular non porph. basalt; groundmass is altered volcanic sand washed into vesicles 1236' - 1240' med grey, mnr vesicles 1236' - 1248' med grey, sparsely porph, mod vesicular, relatively unaltered except on some fract. | lt blue clay in vesicles Calcic clay (sil. efferves) on fract./vesic. |
| 75 | 1240' - 1250' | mod 70°-90° stony parallel 30°-40° (dense rock) | | 1241'-1242' dense nonvesicular (flow contact) 1242'-1248' vesicles aligned at 30° ± (flow 3.) | vesicles + fractures mnr. clay + v. fine dissemin. (sericite?) |
| | | | | Flow breccia | |
| | | | | (1248-1249 Basalt flow breccia) | |
| 76 | 1250' - 1260' | entire box highly frac + broken up | | 1248' - 1260' highly altered + broken up - much clay + FeOx/limonite 1248' - 1250' red oxidized matrix, non porph. + highly vesicular. H. blue clay in vesicles at 1250' becomes R.C. grey again with much clay + limonite as well as being very broken up. on occasional plag phenocr (≤ 4mm) can be spotted. Sometimes this plag seems altered. | extensive alter. on all surfaces possible slickenside could be fault zone |
| 77 | 1260' - 1269' | basalt strong random fract (broken up) | | 1260' - 1263.5 less altered, but more vesicular still highly fractured | |

CORE LOG

PROJECT Cascades drilling WELL NUMBER G20 N-3 LOCATION _____

WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 8-11-87 PAGE 10

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|--------------------|--|----------------|---|--------------|
| 77 | 1260' 1269' | 1263.5 - 1265.5 highly random frac. 1265-1269 mod 0° | | 1263.5' - 1276' Lahar or volcaniclastic (?) lt. brn. matrix with varied sized clasts - usually vesic. med. grey mod. grey, non-porph. ^{andesite} ranging from ash to blocks; Occasional coarsely porph. clast (Plag. ~ 20%) subangular to subrounded; med. consolidated. Gradational contact with overlying + underlying basalts. Basalt crude bedding and grading indicate volcaniclastic; however there is a wide range of grain sizes without grading present as well (Angular basaltic blocks that appear suspended in mud/soil matrix - matrix is of varying lithol. also). Doesn't have appearance of being transported far (Lahar?) ^{ash} Lahar to 1272' then volcaniclastic | c, med. grey |
| 78 | 1269' - 1278.5' | mod 0° 1269-1276 1276-1278.5 rand. strq | | 1276' - 1289' Andesite: mod porph, Plag ~ 15% (< 2mm) clay on no olivine visible; med grey 1276' - 1279' Flow Breccia (Top) v. vesicular; much FeO _p in vesicles on fract's; 1279 - 1289 - Flow center - few vesic, dense | |
| 79 | 1278.5 1289 | | | fewer frac. + alter 1283' - 1285' Flow breccia - purple-red v. vesic + broken up grading to orange more consolidated with increased alteration 1285' - 209 andesite (?) high vesic, highly oxid, highly clay altered, orange - no evidence of flow breccia - appears to be solid flow; plag decreases to ~10% | |
| 80 | 1289' - 1299 | entire box broken up at random angles | | | |

CORE LOG

PROJECT Cascades Geo-Thermal WELL NUMBER Geo N-3 LOCATION: _____

WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 8-12-87 PAGE 11

| BOX # | Box interval | FRACTURES | GRAPHIC Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|--------------|---|----------------|--|--|
| 80 | 1289 - 1299 | entire box broken at random angles except in Andes. which shows few 30° | | <p>Lahar? unconsolid. ash ^{poorly consolidated}; heterolithologic capilli - subangular ^{mostly} vesic. basalt/Andersite (usually highly oxid) with dense non vesic dk grey basalt + a few plaq. crystals. occasion The vesic. & angul. of grains as well as lack of bedding indicate water laid deposit not likely, or grading</p> <p>1290' - 1291' <u>Andesite</u> slightly vesic.; porph; plaq ~ 50% no olivine visible; dense med. grey gradational contact with above pyroclastics; Si. oxid grndms.</p> | |
| | | | one unit | <p>1291' - 1292' <u>ash + anders</u> - unconsolid - ash; to block size frags; heterolithologic; most ash part vesic + highly oxid no sorting or grading</p> <p>1292 - 1297' <u>interbedded Flow breccia and ash and anders</u> - highly broken up and poorly consol; Solid blocks of andesitic flow breccia mixed with much ash + vesicular basaltic anders</p> | |
| 81 | 1299 - 1309 | mod 0° frac in Andes. highly broken & fract in breccias + volcanoclast | | <p>1297 - 1301.5' <u>Andesite</u> med grey/brown v. vesicular (1mm - 1cm) open; porph; plaq < 50% (< 2mm); 1297 - 1298.5' <u>Top flow breccia</u> - v. vesicular, red oxid, broken up</p> <p>Basal <u>Flow Breccia</u> 1301 - 1301.3' <u>oxid</u></p> <p>1301.5 - 1303' <u>volcanoclastic</u> (?) → broken up and frac crude sorted heterolithologic grains; size ash to block - blocks are vesic. basalt (red oxid. to brown grey) grains appear mildly reworked.</p> <p>(?) gradational contact + 1303 - 1303' <u>Top Flow breccia</u></p> | <p>lt. clay in vesicles</p> <p>much limo & FeOx on Flow breccias</p> |
| 82 | 1308 - 1318 | highly broken a fract at random angles most predom 15° to 60° - 90° | | <p>1303' - 1317' <u>Andesite</u> - highly broken with intense red oxid color; highly vesicular (1mm - 2cm) vesic rounded w/ no apparent orientation</p> <p>1308 - 1314' <u>intra flow breccia</u> - red-orange, broken and altered vesicular just like rest of flow. Clasts are vesic and altered as well - range from lapilli to block size (1303 - 1308 could be Flow breccia as well, this entire unit would then be Flow breccia.)</p> | <p>highly broken up</p> <p>lt. clay in vesic</p> <p>highly oxid</p> |
| 83 | 1318 - 1327 | mod, but rand 0°, 30° 40° - 65° | | <p>1317 - 1326' <u>Flow</u> is dense + more consoli, but still highly vesic. + red oxid. Flow center</p> <p>1326 - 1328.5' <u>breccia</u> again - red oxid broken w/ much clay/FeOx on all surfaces.</p> | |
| 84 | 1327 - 1336 | mod to strq 0°; mod 65° - 75° | | <p>1328.5' - 1337' <u>Basaltic Andesite</u> sharp contact med. grey no oxid. color, mostly non vesic. coarsely porph. Plaq ~ 20% (< 1mm)</p> <p>1335 - 1337' <u>Flow breccia</u> vesic, oxid mildly purplish red</p> | <p>mnr zeol in vesicles</p> <p>disseminate pyrite (?) (v. rare)</p> |
| 85 | 1336 - 1346 | rand. mod 30° to 80° 90° And. rand in all dir. | | <p>1337' - 1341' <u>Andesite</u> ? deep red oxid. color highly vesicular; vesic usually rounded (2mm - 5mm) this section is fract. mod porph; plaq ~ 50% (< 1mm)</p> | <p>lt. clay on vesicles</p> <p>FeOx "mud" in vesicles</p> |
| 86 | 1346 - 1355 | strong 0° - 30° few 80° - 90° 1350 - 1351 all broken up & fract | | <p>1342 - 1354' <u>Andesite</u> mod. porph ~ 20% - 25% plaq (< 2mm), med grey to dk grey - v. little alteration, even on fract</p> <p>1354 - 1355' <u>flow breccia</u> highly broken & oxidized. Dense non vesic. 1342 - 1346. 1346 + 1350.5' mod. vesic. 1350 - 1351 dense; 1351 - 1354 v. vesic. (< 1cm) still med grey</p> | |

CORE LOG

PROJECT Cascades Geotherm WELL NUMBER Geo N-3 LOCATION _____

WELL HEAD ELEV. _____ LOGGED BY H. Lemons DATE 8-13-87 PAGE 12

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|---------------|--|----------------|--|---|
| 87 | 1355 - 1364 | strong 70°-90° 1355-1358 1358-1364 mod rand 0°, 30° 70°, 90° | | 1355' - 1358.5' Andesite? red highly oxid ^{vesic} grading to slightly oxid red/grey non vesic. porph. plag ~10% (<2mm), increasing to ~15% 1358.5' - 1362' Flow breccia - still highly oxid + vesic, v highly broken + altered - red | much clay and Fe on fract. |
| 88 | 1364' - 1375' | rand. strg. 1364'-1370° mod 0° 1370' 1375' 30° | | 1362' - 1365.5' Andesite? red oxid, highly vesic porph plag ~10% (<1mm) vesic. (<1cm.) 1365.5' - 1374' Flow breccia (B) - red highly oxid; vesic, much fract + alter. Clasts are difficult + to disting. due to frac. nature but appear to be grey toned vesic basalt/Andesite, porph - plag ~15% vesic. (<3-4cm) | limonite on fract clay, FeO on fract, filling vesic. |
| | | | | It appears that these past flow have been so small that the entire flow has oxidized and remains vesic even to center. | |
| 89 | 1375' - 1384' | mod. 0°-30° 1375'-1380° highly rand fract 1380- | | Basaltic or Andesite 1374' - Andesite: H to med grey with mildly oxid grndmass; porph. plag ~15% pyrox (?) <10% vesic. 1374'-1377' vesic. open (<1cm) 1377'-1381' dense and non vesic; gradual increase in grndms oxid. (<2cm) 1381'-1384' v. vesic, dense med grey (oxid decreases) 1384'-1388' vesic. decrease (few left (<1mm)) | alt. clay in ves. rare Mn, Zsch? in vesic |
| 90 | 1384' - 1394' | mod. parallel 60°-70° mod par 0°-30° | | 1389'-1390' fract. + broken up 1391'-1398' highly broken up + altered (possible intra-flow breccia??) v. few vesicles | |
| 91 | 1394' - 1403' | 1394'-1398' broken up 1398'-1403' few par 40° | | 1398' - 1403' vesic. grey/brown toned w/ grndmass oxid | |
| 92 | 1403' - 1412' | 1407'-1410' par 40° mod. 0°-30° in rest | | 1403' - 1408' dense with few vesicles (<1mm) mod porph plag ~15% pyr. <10% 1408' - 1412' highly vesic. (ves <2cm) 1410'-1414' broken up into small pieces | |
| 93 | 1412' - 1420' | fract + broken at random | | 1412' - 1413' dense non vesic med grey; slight oxid; grndmass 1413' - 1416' INTRA FLOW BRECCIA: matrix grey/red to brown dense non ves highly frac + broken; elasts - mod. vesic, mod oxid, | much clay FeO limonite on flow breccia fract |
| 94 | 1420' - 1429' | mod 0° gen. par, 40° mod 90° | | 1416' - ? non vesic. flow center Mn, grndmass alter. dense med grey; alter. of grndmass is steadily decreasing; till rock is med to dk grey with no alter. | grn, clay on fract. |
| 95 | 1429' - 1439' | mod. p. str. 30° mod par ~ 60°-70° sev. 0° (rand.) | | fracts appear to follow flow lines ~30° | not much alter, even clay on fract |
| 96 | 1439' - 1448' | 1439'-1441' ext. 90° fracs 80° mod 70°-80° strong 60° | | flow angle ~ 60° fracts follow flow fairly well fract area, but no alter. | v. Mn, grey clay (color,) |

CORE LOG

PROJECT Cascades Geoth WELL NUMBER Geo N-3 LOCATION _____
 WELL HEAD ELEV. _____ LOGGED BY M. Lemieux DATE 8-13-87 PAGE 13

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|--------------|--|----------------|---|--|
| 97 | 1448'-1457' | sev. 0° mod. 70°-90° most frags appear fresh w/ little alter. | | same | |
| 98 | 1457'-1469' | 1457-1466 mod. par. 50° 1466-149 broken up | | 1466-1471.5' Flow breccia; 1466-1468 appears to be basal 1468'-1471.5' appears to be flow top of center (y) flow. v. vesicular oxid. obvious clasts (more vesic) in less vesic matrix of same comp. highly broken fracture and altered with clay red brown grading to purplish grey and then red again - porph. (Plag ~ 10%) | much FeOx and limonite + clay coating in vesic. |
| 99 | 1469'-1480' | 1469-1471.5 broken up 1471-1476 mod 0° 1476-1478 broken 1478-1480 mod 0°, few 50° | | 1471.5-1479 Andesite? v. vesic. porph. plag ~ 10% highly red oxid. appears to be solid flow (no clasts visible) vesic (< 2cm) This could be breccia flow | |
| 100 | 1480'-1490' | entire box broken up mostly 0°, few 80° | | 1479-1494.5 Breccia Flow: grading from purplish grey to reddish grey mod vesic, vesic (< 1cm) clast are usually mod grey vesic of similar comp. very highly broken up and fract with much clay. | |
| 101 | 1490-1500 | 1490-1495 broken up + rand. frac. 1495-1500 ext. 40° frac. par. to flow ~ 40° much clay on these 40° frac. | | Andesite or Basaltic Andesite 1494.5-1509 porph. plag ~ 5-10% 1494.5-1495.5 vesicular med grey with limonite oxid. 1495.5-1501.5 dense with extensive red oxid on what looks to be flow bands; (red/grey) | |
| 102 | 1500-1509 | entire box is highly fract. @ rand. 45° | | 1501.5-1509 flow center(?) except highly fract. non vesic, dense (w/ FeOx oxid); (does appear to be flow breccia) | |
| 103 | 1509-1520 | 1509-1514 broken up at all x's 1514-1520 mod 0°, 40° few 20° | | 1509-1513.5 Basal(?) Flow breccia purplish/brown to grey, v. vesic, broken up and fract; clast vesic, alter and of same comp | |

| BOX # | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|---------------|--|----------------|---|--|
| 104 | 1520' - 1529' | 0° fract most promin. sev. 0-30° frac s - parallel occas. 40° paral. | | 1513.5 - 1539 Andesite(?) - med to dk grey; porph- < 5% plag. (< 2mm); v. fine grained < 1% py(?) (< 1mm) | |
| 105 | 1529' - 1538' | mod. 0°-20° frac thru whole box, few 90° | 1 flow | 1513.5 - 1516 Top flow breccia - red oxid; vesic. clasts 1516 - 1524' med to dk grey (red) mod. vesic.; (1mm-1cm) slight oxid. of gnd mass 1524' - 1539 dense + med to dk grey no vesicles or gnd mass alter; little or no alter. on fractures (flow center) (mnr. evid. of basal flow breccia) | FeOx, clay on most surfaced rare acicular radiating zeolite in vesicles |
| 106 | 1538' - 1548' | 0° most prominent few 60° | | 1539 - 1550 Andesite - highly vesic. (1mm - 4um) 1539' - 1542 red/grey oxid gnd mass; pretty well sorted (few frac not f.B.) upper flow breccia | much limon. on frac |
| 107 | 1548' - 1557' | 0° most prom. 1556' - 1557' par 50° frac | | 1542 - 1556 med grey w/ only mnr oxid decrease in vesicles mnr evid. of basal flow breccia | H. FeOx clay on frac |
| 108 | 1557' - 1567' | 0° most prom sev. 50°-60° par. | | 1550 - 1565 Andesite vesic med grey gnd mass w/o x vesic (1mm - 2cm) open 1550 - 1551 Upper flow breccia red vesic, broken 1551 - 1555 med vesic (grey) dark 1564 - 1565 ← mnr. vesic (grey) dark 1555 - 1564 - dense, med grey few vesic mnr. presence of f.B. (basal) | mnr. clay on frac mod. well zeolites in vesicles appear in this flow |
| | | | | 1565 - 1570.5 Andesite 1565 - 1567 Top flow - red/grey oxid gnd mass med grey/red spars. porph plag < 3% entire flow is vesic. decreases w/ depth (open 1mm - 1cm) slight oxid gnd mass (mnr.) | extensive limon. on 0° fract FeOx/limon in vesicles |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|---------------|--|----------------|---|-------------------------------------|
| 109 | 1567 - 1576.5 | 0°-10° common few 40°-60° | | same | mnr. clay in vesic. |
| 110 | 1576.5 - 1586 | 1576-1578 broken up 1578-1586 mod 0°-20° 160° | | 1576.5' - 1587' Andesite med grey spars porph plag < 50% 1576.5' - 1578.5 Top flow breccia; red oxid, grey vesic, broken up and altered 1578.5-1582 vesic; grey w/ mnr. red oxid vesicle open range 1mm - 4um. 1582-1587 dense few vesic. no oxid. mnr. oxid. of basal flow breccia (< 1') | mnr. limonite in vesicles |
| 111 | 1586 - 1597 | 0° v. common 1 40° fract (broken up in flow breccia) | | 1587 - 1597 andesite porph plag < 50% med pyrox. cc. idio alter. highly grey 1587-1588 top flow breccia - red / grey vesic. 1588-1589 vesic. (ves < 1um) open and rand. orient. w/ v. mnr. grndms oxid 1589-1597 non vesic dense (flow under) no oxid | no alter except on flow inter-faces |
| 112 | 1597 - 1609 | mod 40° few 0°-20° | | 1597 - 1607.5 Andesite med grey porph - plag < 10% 1597-1598 Top flow breccia broken & altered red oxid vesic 1598-1606.5 grey vesic; vesic open & aligned par. to flow @ ~40°; mnr. oxid. of grndms. 1606.5 - 1607.5 Basal flow breccia grey red vesic w/ v. vesic basaltic/and. clasts slight increase in grndms oxid (from flow center) | |
| 113 | 1609 - 1629 | unconsol. & broken | | 1607.5 - 1659 Agglomerates / ash + anders / scoria poorly consolidated; vesic; red ash + anders; clast in agglomerate are grey vesic basaltic (upto bombs + clast size) some yellow clay alter. on fract General decrease in deep red oxid color anders & ash as you go deeper in unit (agglomerates and scoria) | |
| 114 | 1629 - 1639 | unconsol. & broken | | same | |
| 115 | 1639 - 1649 | unconsol. & broken | | same | |
| 116 | 1649 - 1657.5 | unconsol. & broken | | same | |
| 117 | 1657.5 - 1667 | fract + broken 0° most common | | Agglomerate 1658 - 1659 lapilli tuff - yellow ash matrix with gradation from 1659' to 1658.5 lapilli tuff to 1657.5 - 1658 Agglomer. (larger clasts than at contact) | |
| 118 | 1667 - | | | 1657' - | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|--|----------------|---|--|
| 119 | 1667' - 1676' | mod 60°-70° fracs sever. highly fract. broken sect. | | 1659' - 1733 Basaltic andesite - ^{sparse} mod porph, plag - < 10% oliv. < 10% med grey | |
| 120 | 1676' - 1685.5' | most of box all fract - few recognizable 70° fracs | | 1659' - 1685.5' ^{Top} flow breccia (?) highly fract. & broken but ^{mostly} unobid (i.e. med grey) yellow clay (?) on fract - in top 1 foot. mod vesic (1mm - 4mm) some void port. vesicul gradually decreasing | mnr. clay coatings on fracs. |
| 121 | 1685.5' - 1695' | 1685 - 1688 strg 50° 1688 - 1695 0° - 30° mod. to strg. | | 1685.5 - 1732' ^{1685.5} Flow cent. dense, non vesic. med grey; | v. little alterat. |
| 122 | 1695' - 1704' | sev. rand. 40-60° mod 60° This box is fairly fractured (sev. fresh fract) | | same | mnr. clay on fracs |
| 123 | 1704' - 1713' | 0° most promin. mod 90° fracs few 60° (overall v. fract.) | | same | 90° fracs have clay coating (white) |
| 124 | 1712' - 1723' | mod 0° few 80° few 90° | | same | |
| 125 | 1723' - 1732' | mod 0° - 20° mod 40° to strg highly fract box | | < 10% black phenos (< 1mm) hmbd (?) no cleav. visible; disappear of olivine - flow becoming andesite | lt. clay coating on fracs. |
| 126 | 1732' - 1742' | 0° in consolid portion random in rest C | | 1732' - 1733 basal flow breccia; slightly vesic grey/brown broken up; sharp contact at base | |
| 127 | 1733' - 1742' | | | 1733 - 1734 crystal lithic tuff brown ash with small vesic. lapilli plag - 3% (< 1mm) 1734 - 1736 volcanoclastic (?) graded w/ yellow clay/ash matrix - lapilli subrounded to subangular, & of heterolithic composition also vesic but usually dk grey to red basalt 1736 - 1742.5 lapilli tuff 1736 - 1742 Tan with heterolithic vesic. porph. basaltic clasts (plag crystals), no grading visible, highly broken portions; agglomerate | |
| 127 | 1742' - 1751' | mostly unconsolid | | 1742 - 1746 red ash w/ lapilli to ash size clasts w/ rd + grey vesic basaltic clasts poorly consolidated andesitic | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|--|----------------|--|---|
| 128 | 1751' - 1760' | random 1751-1753 broken up 0°-40° mod. remainder few 90° | | 1746-1780 Basaltic Andesite; med. grey, porph. plagioclase < 10% oliv < 10% (< 1mm) | 10% |
| | | | | 1746-1755.5 Top flow breccia - med grey B.A. with red oxid. vesic. clasts (lapilli to block size) - both are porph. plagioclase ~ 10%. 1746-1751 - highly broken up and oxid (mostly red). | non vesic. maf black waxy clays on some frags |
| | | | | 1755.5-1778 non vesic. flow center med to dk grey (v. few vesic. in sections) | |
| 129 | 1760' - 1769.5' | mod oo sev. 70° fract w/ FeO coating | | 1778-1780 Basal Flow breccia (following flow lines) grey dense non vesic matrix w/ deep red oxid vesic clasts (lapilli to block size) (these blocks look like they are from underlying unit.) | brown red +/- limonite on 70° fract + brn clay on all frags |
| 130 | 1769' - 1778' | 0° mod -30° | ⊕ | | |
| | | 1772-1778 ran highly frags (70-90° seems promin.) | | | The few vesic. present have v. maf circular round vesicles on lt gr. clay coating |
| 131 | 1778' - 1788' | 0° mod mostly broken & unsorted | | 1780-1783 cinders and ash: unconsolid red ash cinders with grey non vesic porph basaltic lapilli | |
| | | | | 1783-1789.5 Flow breccia (Basaltic Andesite?) med grey porph. plagioclase ~ 10% with vesic. red oxid clasts; 2-3 mm flow banding - poorly unconsolid. | |
| 132 | 1788' - 1797' | few 0° mostly broken & unsorted | | 1789.5-1790.5 crystal lithic tuff - Tan ash matrix with coarse plagioclase crystals (< 3mm) and red oxid basaltic lapilli (also contain plagioclase) no bedding or grading | |
| | | | | 1790.5-1795 Basaltic: v. f. gr. dk grey spars. porph. plagioclase = oliv < 10% highly vesic (< 1cm) gradational contact above and below, highly broken and fract espec. - 1793-1795 flow breccia (no top flow breccia visible) | F.B. highly oxid. |
| | | | | 1795-1795.5 Tan crystal lithic tuff - Tan similar to 1789.5-1790.5 | FeOx, limon on frags |
| | | | | 1795.5-1798 ash flow - white matrix with horiz elong. welded mod. welded frags of shards & ash not devitrified grading to yellow matrix | |
| 133 | 1797' - 1807' | " | | lapilli tuff 1798-1800 yellow ash matrix with lapilli + vesic dk grey or red basalt no grading or bedding evident | |
| | | | | 1800 - Sorted & agglomerate same yellow ash matrix - just larger clasts - many plagioclase crystals (< 3mm) | |
| 134 | 1807' - 1815.5' | " | | poorly consolidated most clasts are dk grey basaltic slight vesic. (no cinders) coarse porph | |
| 135 | 1815.5' - 1825' | " | | same plagioclase ~ 15% (< 4mm), some few v. vesic. | |
| 136 | 1825' - 1834' | unconsolid totally | | same occasional red oxid clast inside basalt block (flow breccia?) | |
| 137 | 1834' - 1847' | " | | same | |
| 138 | 1847' - 1859' | " | | same | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|---------------|---------------------------------------|----------------|---|-------------------------------------|
| 139 | 1859'-1869' | mostly unconsol | | 1861'-1863 Basaltic Andesite Breccia Flow med grey non vesic. coarsely porph plag ~15% (<4mm) w/dk grey vesic. similarly porph clast 0.1w(?) <<10% | |
| | | | | 1863'-1920' cinders, ash and agglomerates poorly consolidated but clasts are more vesic and oxid with (as before) lighter yellow/tan matrix (range from lapilli to block size) as you go deep amt. of deep red oxid increases (more cinders, unlike cinders and red ash dominate (Box 142-143)) | |
| 140 | 1869-1878 | " | | Box 140 is mostly yellow tan with red oxid vesic agglomerate | |
| 141 | 1878-1887 | " | | basaltic blocks 141 - all ash + cinders | |
| 142 | 1887-1897 | " | | | |
| 143 | 1897-1907 | " | | | |
| 144 | 1907-1916.5 | " | | at 1914.5 grey ash begins to predominate (cinders + red ash still present) | |
| 145 | 1916.5-1925.5 | " | | 1927-1920.5 red ash + cinders again (unconsol) | |
| | | | | at 1920 ash cinders begin to be consolid | |
| | | | | 1920' - Bas. Andesite of ^{prob (?)} Andesite med grey coarsely porph. plag ~20% (<1cm) 0.1w(?) << 10% on vesic. cpyr <10% (<2mm) | |
| 146 | 1925.5-1939 | sev 0° w/ clay layer on frags. | | 1920-1925.5 Top flow breccia vesicular highly red | |
| | | | | oxid. grading to gray non vesic matrix (with grey vesic clasts) coarsely porph | hard yellow mnr clay, FeOx on frags |
| 147 | 1939-1944 | strg 65-90° w/ alter. | | Same | |
| 148 | 1944-1954 | still 80°-90° but not as strg | | Same | |
| 149 | 1954-1963 | mod 60-90° | | Same | |
| 150 | 1963-1973 | Ext 80°-90° low 0-20° | | Same | |
| 151 | 1973-1982 | mod 70-90° frags | | Same | |
| 152 | 1987-1991 | Ext 80°-90° | | Same | much clay on frags mnr FeOx |
| 153 | 1991-2000 | highly fract strg 0-30° | | Same | |
| | | 70-90° true 60°-15° in sev ang pieces | | | |
| 154 | 2000-2009 | Strg. par. 70° Ext. 90° fine | | Same | |

mod 0-20° decrease at 2007.5 to mod 0-30 only

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|----------------|--|----------------|--|---|
| 155 | 2009.5' - 2019 | ext. 80°-90° ext. 0°-20° | | same | |
| | | 2009.5-2011 v. frac w/ hard clay on all surfaces | | | |
| 156 | 2019' - 2029.1 | ext. 90° ext par. 70° | | same | |
| 157 | 2029.5' - 2037 | 2027.5-2033 sev. par 60-70° w/ hard clay | | same | |
| 158 | 2037 - 2046 | mod 0°-20° | | at 2040 max qndms begins to be oxid sh. at 2044 ~ 4" basal flow breccia (non vesic.) | |
| 159 | 2046 - 2057 | mod 0° | | 2044 - <u>Andesite</u> : red oxid qndms.; coars. <small>rare euhedral</small> porph. plag ~ 20% (< 1mm); pyrox ~ 5% (< 2mm) 2044-2047 top flow breccia - highly oxid + broken bright org. red color; vesicular | mnr Fe ₂ O ₃ clay on 0° fracs |
| 160 | 2057 - 2067 | mod 0° few 90°-80° | | mod vesic. 2044-2071 - the mostly dense & non vesic. (still oxid qndms.) | |
| 161 | 2067 - 2077 | mod 0° @ 2072-2077 sev 90° fracs w/ clay +/- limon. | | same | |
| 162 | 2077 - 2086 | mod 0° mod to strg 90° | | same dense non vesic. | 4" tan earthy clay on all fracs espec. 90° |
| 163 | 2086 - 2095 | mod 0° sev 55-70° mod 90° | | same | |
| 164 | 2095 - 2105 | mod 0°-30° 2097-2099 ext par 90° | | same amt of py' increase toward bot of unit | |

| BOX # | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|---|----------------|--|--|
| 165 | 2105.5' - 2114' | rand 0°-40° | | Basaltic 2105.5' - 2190' <u>Andesite (?)</u> | |
| | | | | 2105.5' - 2134' - Top flow Beccia - 2105.5 - 2112.5 v, vesic. red brn with red vesic. clasts (alloxid) 2112.5 - 2131 mod vesic., still oxid red brn, but clasts are grey sil. vesic and more sparse, coarsely porph plag ~ 20% (< 1mm) at 2131 - 2134 clast decrease in size (< 2mm) become dk grey, non vesic & v. rare (appear rounded (?)). pyrox < 10% (rare Oliv.?) < 1% (only ~ 2190 -) | Ext limonite Fe ₂ O ₃ on most surfaces and in vesicles |
| 166 | 2114' - 2124' | rand 0°-40° many frac + broken pieces | | Note - phenos size, compo, %, increase + decrease throughout this unit | |
| 167 | 2124' - 2134' | mod 0°-20° few 40°-50° | | | |
| 168 | 2134' - 2143' | sev 0° few 40° 2134' - 2141' - end of box Ext. 0° "plate" fracs. | | At 2142 plag decrease to ~ 30% (< 8mm) Flow center | hard clay on o' frags |
| 169 | 2143' - 2153' | Ext platy par 0° fracs few 0° | | @ 2151 Plag increase to ~ 50% | |
| 170 | 2153' - 2162' | Ext 0° fracs strg 40°-80° | | Flow center still | |
| 171 | 2162' - 2171' | mod 0° strg Ext par 40°-60° fracs @ 2162 - 2166 | | " | |
| 172 | 2171' - 2181' | mod few 0° few 70° strg 90° 2181 - 2181 | | Same | |
| 173 | 2181' - 2190' | mod 0° few 50° mod 80°-90° | | same | |
| 174 | 2190' - 2200' | strg 90°-80° mod 0° few 50° | | Basaltic Andesite 2190' - 2190 - 2197 plag decrease to < 10% then back up to 50% | much Mox on fracs? at 2209 v, rare vesic. |
| 175 | 2200' - 2209' | mod 0° few 90° few 50° | | at 2208 plag << 10% flow banding now apparent decrease to med grey bands ~ 3mm thick | w/ rare rounded zeolites + pink |
| 176 | 2209' - 2219' | strg 90° mod 70° few 0° | | | limonite clay FeO x MnO in fracs |

| # BOX | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-------------------|--|----------------|---|---|
| 177 | 22191- 2229.5' | str 90° ext. fract in alt. direct | | same | yellow wht. clay on fracs |
| 178 | 2229.5'- 2239 | str 90° mod 0° sew. broken intervals | | same Flow 2227.5 - 2231 Basal breccia med grey non vesic; non porph; with slightly vesic, porph. med grey clasts highly frac & broken w/ clay on all surfaces | |
| | | | | 2231.5 - 22709 <u>Andesite</u> Top Flow Breccia - 2231.5 - 2239 ^{52 med to sl.} v. vesic red oxid color vesic open & orientated elongated horiz. 2238 - 2239 broken into small pieces (which have much limonite) at 2239' - 2252' oxid. + vesic. decrease (clasts are still vesic.) porph - plag < 10% tan/grey color | |
| 179 | 2239'- 2257 | mostly broken few 0°-40° str | | Flow center - decrease in vesic (some still 1ft) med grey plag < 10% | Pink clay on all weathered surfaces |
| 180 | 2257'- 2260' | mod 0° few 30° | | 2269 - 2283.5 <u>Andesite</u> | |
| 181 | 2260'- 2272 | mod 0° 2270 - 2271 broken up. | | 2269 - 2274 <u>Breccia Flow</u> (?) highly broken vesic brown/red w/ much tan clay on alt. surfaces coarse porph. plag < 20% (< 4mm) | lt. yellow clay on frac |
| 182 | 2272 - 2281 | very broken p | | 2271 - 2274 more consolidated, still vesic & broken w/ minor oxid. 2274 - 2283.5 flow center (?) still coarse porph w/ plag < 20% med grey w/ minor quartzels oxid pyr < 10% (< 2mm) | smectite +/- sulfur cement limonite/ FeO filling vesic |
| 183 | 2281 - 2291 | mod 0° 2283.5 - 2289 badly broken | | 2283.5 - 2315 <u>Basaltic Andesite or Andesite</u> (?) 2283 - 2289 Top Flow Breccia reddish grey v. vesic v. broken 2289 - 2292 vesic med grey still fract coars. porph plag < 25% (< 1cm) pyr < 10% oliv (?) < 10% | much clay in Breccia |
| 184 | 2291 - 2301 | mod 90° few 50° few 0° few 80° | | 2292 - 2315 Flow center non vesic. coarse purple med grey no oxid | |
| 185 | 2301 - 2311 | mod 60° 2301 - 2303 2304 - 2311 mod 90° mod 0° | | same - 2315 | |
| 186 | 2311 - 2320' | mod 70-90° 2315 - 2319 highly broken + frac | | 2313 mnr vesicles; sl. oxid in these vesic. | |

CORE LOG

PROJECT Cascades Duffing WELL NUMBER Geo N-3 LOCATION _____

WELL HEAD ELEV. _____ LOGGED BY ML DATE 8-25-87 PAGE 22

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|---|----------------|---|--|
| | | | | 2315 - 2368 <u>Basaltic Andesite (?)</u> | |
| | | | | 2315 - 2319 Top Flow Breccia - mildly oxid grey/red mod vesic; v. broken & fract porph plags ~ 25% | much grey clay coating on frags, |
| 187 | 2320' - 2329' | strg. rand 70-90° mod oo | | 2328 - 2329 ^{mod.} vesic. med grey porph pyr < 4% v. mnr. oxid. of qndmass | |
| 188 | 2329' - 2338' | 2329-2331 Ek rand frags in all direct mod oo mnr. 50° | | Flow center 2329 - non vesic. med grey ho oxid. of qndmass porph - plags ~ 20% pyr - 1% ? plw < 1% | some 90° frags show weathered plags and rare acicular zeolites |
| 189 | 2338' - 2347' | mod oo 2345-2349 Ext. 90° | | same | wt. / TAN clay on 90° frags |
| 190 | 2347' - 2357' | few 70° 2349' - 2363.5' Ext. 0° frags | | same | dark bn - black clay on 0° frags (mox (?) |
| 191 | 2357' - 2368' | ↓ 2363.5 - 2368 mod oo | | same | |
| 192 | 2368' - 2378' | mod oo | | 2368' - 2400 <u>Andesite</u> 2368' - 2370 Top Flow Breccia - v. vesic. deep red oxid birod. frags.; (1mm-4um) | |
| 193 | 2378' - 2387.5' | mod oo few 50° | | 2370 - 2380 Deep red v. vesic grading to red bn mod vesic. grading to red grey sli. vesic. sli. porph phenos < 1% plags > cpx. (vesic decrease in size also to < 2mm) | |
| 194 | 2387.5' - 2397' | ext oo mnr 50° | | 2380 - 2400 med grey non vesic flow center occasion. lg. vesic. (< 4um) | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | | |
|-------|-----------------|---|----------------|---|--|--|
| 195 | 2397' - 2408' | mod 0° Ext 45° mostly broken up | | 2400' - 2413' Flow Breccia (Andesitic) 2400' - mod porph. (2-3mm) 2400' - 2408' - v. broken, red grey oxid. mod vesic. much clay on all surfaces 2408' - 2408' still broken & clay coated but less oxid (grey brown) & less vesic. 2408' - 2413' - more cons. no acid (med grey) evid. clasts - dk grey similar comp. also mn vesic. v. vesicul (210um) | | Clay, FeOp in frags |
| 196 | 2408' - 2420' | mod 0-30° mostly frac. + broken | | 2413' - 2422 Volcaniclastite - poorly unconsolid. - orange to deep red to grey/red - grading evid. matrix mostly ash size part; clasts are v. vesicular (lapilli size) | | |
| 197 | 2420' - 2432' | uncons. frac. ext 90° | | 2422 - 2429 Andesite 2422 - 2429 top flow Breccia - med. grey mod vesic. with mn FeOp. v. vesic. size clast - clast vesic dk grey, v. broken up | | much FeOp in volcanic clastic yellow br clay at 90° frac. |
| 198 | 2432' - 2442' | Ext 90° to 2434° then mod 0° mod 400° | | 2429 - 2449 non vesic med. ^{grey} aphanitic andesite at 2441.5 gradings becomes mn. oxid (thus appears to happen on flow bands) | | FeOp |
| 199 | 2442' - 2451' | Strg 0-30° Ext 70-90° mod 900° | | same | | comg FeOp limon on frac. |
| 200 | 2451' - 2467.5' | v. broken & frac in rand ang mod 45°, 0° | | 2449 - 2456 ash flow 2449 - 2451 black vitrophyre densely welded grading into tan dens (totally black welded) welded zone w/ black same pnc matrix same (still dark red) grading into pink poorly welded at 2453 - 2456 | | |
| 201 | 2467.5' - 2472' | mod 0° sev. broken up zone | | decreasing welding through zone | | |
| 202 | 2472' - 2482' | mod 0-20° at 2480 rand frac 90° v. strg | | 2456 - 2496.5' Basaltic Andesite (?) 2456 - 2482 ⁷¹⁵ top flow Breccia med grey w/ strg org FeOp? coating v. vesic. v. broken (vesic < 6mm) | | H. clay coating on many frags |
| 203 | 2482' - 2491' | Ext 90° 2482 - 2486 2488 - 2491 Ext 0° | | 2472.5 - 2480 mod vesic. dk grey aphanit 2480 - 2482 matrix frags. 2482 - non vesic, much more fractured (flow center) | | FeOp in vesic mn limonite in some vesic Ext FeOp on 90° fract |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | It |
|-------|-----------------|--|----------------|---|---|
| 204 | 2491'-2501' | Strg 60 mod to sev. broken zones | | 2494-2496.5 Basal Flow Breccia - med grey w/ mnr, red org. oxid. Si vesic. (especially clasts) mod. broken. | yellow clay on 90° fracs red FeO ₂ on 0° fracs |
| | | | | 2496.5 - 2498.5 Lapilli tuff - 2496.5-2497 - mostly red oxid. ash grading into greenish yellow matrix w/ poorly consol. heterolithic lapilli (mostly dk. grey vesic. Bas. and) | |
| 205 | 2501'-2514' | mod. 0° mostly broken up. | | 2498.5 - 2503 - scoria - med grey vesic, unconsol (ash flow?) 2503' - 2530 ^{5'} lithic lapilli tuff pink org ash w/ heterolithic lapilli - pumice frags, no vitrophyre | much grey clay on all surf. in vesic |
| 206 | 2514' - 2523' | mod 60 | | 2530 ^{5'} - 2545 ^{5'} Basaltic Andesite; med, to dk. grey sparsely porph. oliv < 10% plag < 10%. 2531-2536 mod vesic (mm - 2mm) 2538 - 2545 dense (non vesic) 1545 - 1445 Basal flow Breccia med/grey red - vesic | 2530 ^{5'} - 2531 top flow Breccia - red/grey v. broken |
| 207 | 2523 - 2533 | mod 0° - sev. broken up zones | | | |
| 208 | 2533 - 2543 | mod 0° - few 60° at 2542-2544 Ext 90° w/ pink-tan clay on fracs. | | | mnr. zeol. in vesic. |
| 209 | 2543' - 2552' | mod 0° - 30° few 85° sev. broken up zones | | 2545.5' - 2557' Basaltic Andesite 2545.5' - 2546' Top Flow Breccia red/grey oxid. vesic. broken up 2546 - 2548 vesic. med graph spars porph oliv < 10% (< 1mm) plag < 10% (< 1mm) | |
| 210 | 2552' - 2567' | mod. 0° - 40° few 90° 2557-2567 broken up. | | 2548 - 2553 mnr. vesic. 2553' - 2555' 2555 - 2557 Basal Flow Breccia same descript. as top flow. | |
| 211 | 2567' - 2578' | mod. 0° - 40° few 90° 2557-2567 broken up. rand. frac. in all directions | | Bas. And 2557 - 2601.5 interbedded Flow Breccias + flows | mnr zeol in vesic tan to much clay + yellow on all surface FeO ₂ in vesic. |
| 212 | 2578 - 2587 | mostly frac. | | 2557 - 2583 oxid red highly broken; mod. vesic. aphanitic Breccia? | yellow clay on surf in vesic. |
| 213 | 2587 - 2596.5 | " | | 2583 - 2593 more consolid. vesic med grey aphanitic (still frac to bad to distinguish as "flow") oxid. of groundmass | yellow clay on surf in vesic |
| 214 | 2596.5 - 2606.5 | " | | 2593' - 2601.5 highly fract med grey w/ groundmass oxid v. lg vesic (< 4 cm) aphanitic | Chlorite, red & clay on grass |

| BOX # | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|--|----------------|--|---|
| 215 | 2606.5' - 2618' | mostly broken few 40° few 70° | | 2601.5' - 2603.5' Agglomerate Fr orange ash matrix with dk. grey vesic. basaltic blocks | |
| | | | | 2603.5' - 2604.5' Tuff - tan ash with crude grading, rare lithics | |
| | | | | 2604.5' - 2605' agglomer. same as above | |
| | | | | <u>2605' - 2636 Basaltic Andesite (?)</u> | wt clay coating on |
| | | | | 2605 - 2608.5' flow Breccia mostly unconsol. highly broken + frac. 2605 - 2608.5' scorea | scorea stg orange/red FeOx |
| 216 | 2618' - 2627' | v. broken one flow? | | med grey unconsol. grading into grey brn more solid w/ vesic grey clasts (only part that clasts were visible in nr. groundmass) | 2610 - 2616 |
| | | | | 2608.5' - 2616 unconsol broken & v. altered | |
| | | | | 2616 - 2619 more consol. (possible flow under) mod vesic med grey mn rgrnelms oxid | |
| | | | | 2619 - 2624 totally broken much clay alter brn / tan / grey | ext. FeOx in broken zone |
| | | | | 2624 - 2625 cons. mod ves. med grey aphanitic flow under | |
| | | | | 2625 - 2628 v. broken & alter no oxid of grms mn r to mod. vesic med grey (breccia?) | |
| 217 | 2627' - 2636' | mostly broken few 0°, 65° | | 2628 - 2633 more consol. fewer vesic. mn r. oxid of groundmass | |
| | | | | 2633 - 2636 basal flow Breccia (?) v. broken non vesic med grey mn r oxid grms | |
| 218 | 2636' - 2647' | strg 90° mod 0-70° v. frac. overall | | <u>2636' - 2656.5 Basaltic And. diktyavitic (?)</u> aphanitic - | |
| | | | | 2636 - 2641 top flow Breccia - broken orange/red oxid, mod vesic rare to | strg FeOx on all frags |
| | | | | 2641.5 med. grey aphanitic mn r. vesic. flow under | |
| 219 | 2647' - 2656.5' | Ext. rand frags 2647' - 2653 2653 - 2656 mod 0-30° | | 2653.5 (2633 - 2653.5 mod vesic < 2mm) 2653.5' - 2656.5 Basal flow Breccia (?) somewhat broken red/purple w/ much clay on surfaces mod. vesic. (1mm - 4mm) | turqois/blue clay on frags inhibit. of flow under limonite on frags |
| | | | | 2644 - 2447 | FeOx in vesic. in Basal F.B. |
| 220 | 2656.5' - 2666' | mod 0° most v. rand broken 0° frags w/ clay (yellow) | | <u>2656.5' - 2713 Basaltic Andesite (diktyavitic?)</u> <u>2656.5' - 2681' Top flow Breccia;</u> 2656.5 - 2657 mod broken vesic. deep red oxid w/ dk grey Basaltic vesic clasts 1mm - 2mm 2657 - 2663 highly frac & broke 2663' - 2667' deep red oxid vesic. j consolud aphanitic | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-------------------|--|----------------|--|--|
| 221 | 2666'- 2677' | mod 0-20 mod 90° | | 2667'-2667' broken up + altered (red oxid) | |
| | | many v. frac. sect. | | 2667'-2679' grey/red more consol. decrease in vesic. (still evid breccia although clasts are getting increasingly rare) | |
| 222 | 2677'- 2686.5' | 1 mod 0°-40° | | 2679'-2681' med. grey no red oxid. color, rare vesic. except in clasts that are still present | |
| | | strg | | 2681'-2691' Flow center - non vesic. med grey | |
| 223 | 2686'- 2695.5' | strg @ 165-75° frac | | @ 2691'-2700' med grey/red min. vesic. sect. min. gm mass oxid but isn't isn't broken (intra flow breccia?) | min. clay on frac |
| | | 2686-2691 strg 90° mod | | clasts - clasts are dk. grey mod. vesic. of same comp (block size) | |
| 224 | 2695.5' 2701' | mod 0° few 90°. | | 2700'-2710' non vesic. med. grey flow center | |
| 225 | 2707'- 2716' | mod 0° 2710-2716 broken up | | 2710-2716' Basal flow Breccia - broken up grey/purple mod vesic. (1mm-1cm) | |
| 226 | 2716'- 2725.5' | 2716-2717.5 broken up | | 2713'-2741.5' Basaltic Andesite (Dixtalite?) | |
| | | 2717.5-2725 mod 0-20 | | 2713'-2717.5 Top flow Breccia - Oxid. red, v. vesic. v. broken aphanitic (1mm-1cm) | mar limon. on fracs |
| | | | | 2717.5-2721 mod vesic. grey-red gndms still oxid; | tan clay on fracs. |
| 227 | 2725.5'- 2734' | mod 0° 2730-2731' Ext 90° strg. par, 40° | | 2721-2725.5 few vesic grey w. min gndms oxid ($< 1\mu$) | Ext 1730-1731 purplish clay on 90° fracs |
| | | | | 2725.5-2734 grey unox non vesic. | |
| 228 | 2734'- 2748' | entire top badly broken | | 2734-2741.5 Basal flow breccia purplish grey v. vesic v. broken | clay, FeOx limon on fracs + v. vesic. |
| | | | | 2741.5'-2812.5' Basaltic And - top flow breccia | strg yellow clay coating fracs |
| 229 | 2748'- 2757.5' | badly frac mod 40° mod 90° | | 2741.5-2757.5/ sl. red oxid-grey v. broken & vesic. clasts are not distinguishable | |
| | | | | 2751-2754 - looks like solid flow almost but is frac + oxid gndms. | |
| | | | | 2757.5 - 2759.5 v. broce d vesic but unoxid - not much alter (other than yellow clay) | |
| 230 | 2757.5'- 2767' | 2757-2759 broken up Ext. 90° 2763' | | 2759.5-2764 - med grey unox. mod vesic (flow center) | wt clay on 90° fracs |
| | | | | 2764-2777.5' same dense non vesic | 2771' aphanitic platey dirty textitic |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|---|----------------|---|--|
| 232 | 2767' - 2776' | mnr. 80° mod few 0° | | Same | |
| 233 | 2776' - 2787' | few 0° 90° 2778-2780 broken up | | 2777.5' - 2781' intraflow breccia broken med grey mod vesic. 2781' - 2801' dense with mnr. vesic. (as before) | |
| 233 | 2787' - 2796' | mod 0° 2791-2796 Ext. 90° | | 2792' - 2793' intraflow breccia broken up vesic w/ much FeOx on fract + in vesic. 2801.5' - 2805' intraflow breccia broken mod vesic | |
| 234 | 2796' - 2805' | mod 0° | | med grey / purple with tan-brn clay on most surfaces | |
| 235 | 2805' - 2814.5' | mod 0° to 20° 2812- 2814.5 broken up | | 2805' - 2811.5' dense + non vesic med grey 2811.5' - 2812.5' Basal flow Breccia - mod vesic grey purple w/ v. mnr. grains oxid. | zeolites in vesic in flow Breccia while accumulated elongated |
| 236 | 2814.5' - 2825' | sev. broken sect mod 0-30° | | 2812.5' - 2823' Basaltic Andesite: 2812.5' - 2815.5' Top flow Breccia - greyish red v. broken v. vesic. w. med grey vesic clasts 2815.5' - 2817' vesic dk grey unox aphanitic 2817-2822 same except non vesic 2822' - 2823' Basal flow Breccia: v. vesic, v. broken med grey | limon, oxid. on fract + vesic in FB, Tan clay |
| 237 | 2825' - 2835' | 2825-2829 v. broken 2829-2836 mod 0° | | 2823' - 2846' Basaltic And: 2823' - 2829' Top flow Breccia - v. broken med grey mod vesic, | |
| 238 | 2825' - 2844' | mod 0-20 Ext. 90° | | 2829' - 2846' med. grey, non vesic. aphanitic flow vent | wt-tan clay on all surfaces in flow Breccia also much limonite |
| 239 | 2844' - 2853' | v. broken @ Random 45 | | 2846' - 2860.5' Lahar - brn mud / ash matrix, heterolithic clasts red-grey to dk grey non vesic + vesic. of varying size no grading or bedding | |
| 240 | 2853' - 2863' | " | | | |
| 241 | 2863' - 2873' | Ext 90° mod 0° | | 2860.5' - 2898' Andesite (?) + 2860.5' - 2865' Top flow Breccia - pink oxid to orange w/ v. vesic. clasts, broken up, non porph on 90° fract blue green + blue clay on fract mnr. effervesence some FeOx + red + brn oxid on some surfaces, clasts are only thing that is vesic. (matrix is non vesic.) tan to pink clay filling these vesic. | much brown clay in FB. |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|---------------|------------------------------------|----------------|---|-----------------------|
| | | | | 2865' - 2869.5' dk gm, grey color (possible vesic + ugs chloritization) vesic horiz (< 3mm) elong, + some ^{some} ^{some} filled w/ calcite. ^{some} white fibrous + acicular ^{some} amygdaloid | |
| 24a | 2873' - 2882' | mod 0° Ext 90° | | often radiating well developed crystals (effervesce strongly). Black MnOx present as well; sparsely porph. pyr. w/ well developed crystals (< 2mm) | |
| | | | | 2869.5' - 2883' same except. non vesic. mn. calcite | |
| 24b | 2882' - 2891' | Ext 90° mod 40° v. fract randomly. | | veinlets and 2882' - 2883' ext calcite + blue-green clay on 90° fract MnOx on fraes also 2883' - 2891' - med. grey non vesic (not chlorit.) v. fract | mn red FeOx |
| 24c | 2891' - 2900' | Ext. 90° SV. 0-20° mod 45-50° | | 2891' - 2898' still non vesic, but dk grey gm again (chlorit?) mn. calcite veinlets (gm chloritic grndms) | |
| | | | | 2898' - 2899' Basal flow Breccia ^{dk} grey vesic blocks in tan/red matrix | |
| 24d | 2900' - 2909' | Fract + broken | | 2900' - 2909' agglomerate (?); crudely graded and bedded bright orange ash w/ lapilli to block size grading to tan-brn matrix. lapilli and blocks appear to be v. vesic, dk grey porph. and homogen, large sections are unconsol. (most of unit is poorly consolidated) | |
| 24e | 2909' - 2918' | Fract + broken | | 2909' - 2918.5' Basaltic Andesite | |
| | | | | 2909' - 2918' Top flow Breccia - v. broken dk grey mod. vesic. clasts in tan ash matrix; ^{sl. vesic} mod. | Ext. tan clay on F.B. |
| 24f | 2918' - 2927' | mod 45° mod 90° mod 0°-30° | | 2918' - 2921.5' mod. vesic med grey, broken pyr. ~ 1% | |
| | | | | 2921.5' - 2928.5' same except only mn vesic, sev. broken sections Oliv. < 1% | |
| 25 | | | | | |

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| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|---------------|---------------------------------|----------------|--|---|
| 248 | 2927' - 2937' | rand. broken in all direct | | 2928.5' - 2930' Lahar (?) - Tan mud/ash matrix with dk grey sil. vesic clasts of various sizes; broken up 2930' - 2931' Basalt Flow Breccia; coarsely porph. dk grey Plaq + 25% Oliv < 1% non vesic with vesic, med grey clasts 2931' - 2932' Volcaniclastic (?) dk grey to brn subang. to sub round. grain ^s (< 2mm usually) well consolidated but highly fract. grains mostly basalt. Too fract to det. if grading is present. 2932' - 2935' Agglomerate - poorly consol. Tan-yellow ash w/ red scoreaceous blocks (non porph.) v. broken | H blue clay coating on clasts |
| 249 | 2937' - 2947' | broken + unconsol. | | 2935' - 3007.5' Andesite (?) or Basalt (?); 2935' - 2948' Top flow Breccia - highly fract. 2935' - 2940' med grey to brown w/ brn. clay on all surfaces v. broken mnr. to mod. vesic. clasts, 2940' - 2946' red oxid blocks with much yellow clay on all surface mod vesic. 2946' - 2948' still oxid red but less vesic + no yellow clay | thick tan clay on some fract |
| 250 | 2947' - 2956' | mod 0°-20° mnr. 90° | | 2948' - 3002 dk grey non-vesic aphanitic with mod to strgly chlorit. qndms | |
| 251 | 2956' - 2966' | mod 0°-20° | | same | |
| 252 | 2966' - 2975' | mod 0°-20° | | same | little clay or any other |
| 253 | 2975' - 2985' | mod 0° few 80° | | same | alter. (except chlorit.) |
| 254 | 2985' - 2994' | mod 0°-20° | | same | mnr. calcite on fract. |
| 255 | 2994' - 3004' | mod to strg 0-20 few 80°-90° | | 3002' - 3007.5' Basalt Flow Breccia - pinkish grey v. vesic, v. broken; dk grey vesic clasts aphanitic | mnr. MnOx on fract. |
| 256 | 3004' - 3013' | broken up | | 3007.5' - 3020' Agglomerate 3007.5' - 3013' red-orange ash matrix with red oxid scoreaceous blocks. broken | much limonite 3004-3013 |
| 257 | 3013' - 3022' | v. broken | | 3013' - 3020' yellow tan ash with red to med grey mod vesic non porph clasts poorly consolidated | on all surf; |
| 258 | 3022' - 3031' | mod 0° mod 75-90° mod 45° | | 3020' - 3112' Basalt (?) +/- Andesite (?); 3020' - 3023 Top flow Breccia - dk grey, non vesic. w/ mod vesic dk grey-brn clasts (< 4cm) 3023' - 3103' non vesic dk grey aphanitic; chlorit of qndms. | FeOx on fract mnr. chlorit. of qndms |
| 259 | 3031' - 3040' | mod 0°-20° mod 90° | | same | limonite on fract lt. gm clay on fract |
| 260 | 3040' - 3050' | strg 0° mod 90° | | @ 3042 vesic increase (still minor) - decrease in chlorit (hor. + aligned par.) @ 3050 dk grey - chlorit of qndms, non vesic (again) | gm + blk waxy clay on fract |
| 261 | 3050' - 3060' | mod to strg 0° | | | mnr. MnOx on fract. |

| # BOX | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|--|----------------|--|--|
| 262 | 3060'- 3069' | 0°-20° mod. | | same | |
| 263 | 3069'- 3080' | mod 0° few 45°-50° | | same | |
| 264 | 3080'- 3088' | mod 0° 3084'-3086' strg 90° | | same | |
| 265 | 3088'- 3097' | mod 0°-30° few 90° | | same | calcite veinlets strg chlorite + strg + blue gm. |
| 266 | 3097'- 3107' | Ext 0° Strg 70°-90° | | 3103'-3106' Basal flow Breccia - dk grey to purplish grey, nonvesic. = 120K similar to rest of Ft | |
| | | (Yes) are these related? (appearing compo) | | 3106' - 3112.0' Flow Breccia dk to med grey Basaltic porph frag ~ 25% (< 4mm), vesic. also < 1% (< 2mm) both porph + non porph clasts of all sizes some vesic. some not - these are clasts | clay on frags |
| 267 | 3107'- 3116' | v. frac. 3107'-3112' Ext. 80°-90° Strg 50°-60° | | 3112' - 3140' Ash Flow heterolithic clasts: med to dk grey with dk grey dk med vesic clasts (< 5mm) and med grey non vesic clasts (< 2mm) | @ 3103 Ext Cc on frags @ (FB.) begins |
| | | 3107-3109. Rand in alt dir @ 3112' - mod 0° (not as frac.) | | plag crystals present in both matrix + clasts ~ 50% matrix is dk grey ash fairly well consolid. poorly sorted, no grading present sharp contact at base - | |
| 268 | 3116'- 3125' | mod 0°-20° | | 3123' - Tan ash matrix with increase in variety of clasts: dk grey med porph still present with red oxid non porph + a variety of volcanic lithics poorly sorted, no grading, pumice frags | |
| 269 | 3125'- 3135' | mod 0° few broken sect. | | 3127' - 3140' mod. divitrified zone - glass shared black obsidian elong. horiz. + par. ~ 1um-1cm size pumice frags and volcanic lithics (vesic + non vesic.) of varying lithology, no sorting or grading + varying size frags are angular to subangular matrix - tan-grey ash. | |
| 270 | 3135'- 3144' | mod 0° | | 3140' - 3147' Lahar (3) gradati. contact no sorting or grad. med grey v. clast rich clast heterolithic of all sizes + few pumice frags; frags are ang. to sub ang. + compacted close together (v. little matrix) what matrix is present is grey ash | + blue clay on frags |
| 271 | 3144'- 3155' | v. broken + frac. | | 3147' - 3160' Agglomerate: purplish grey ash matrix with vesic. + non vesic. dk grey basaltic blocks (clasts are similar in compos.) no sorting or grading. | + blue clay on frags |
| 272 | 3155'- 3163' | v. broken + frac. | | 3160' - 3175.5' Flow Breccia: dk purplish grey v. broken + fract. mostly non vesic, non porph. (including clasts) clasts range from dk to med grey + are of similar comp | + gm clay + limon. on frags. |

| * BOX # | Box Interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | L-976 CASE # |
|---------|---------------|---|----------------|---|--|
| 273 | 3163'-3173' | broken+frac in rand direct | | 3175.5' - 3183.5' Basalt; 2175.5 - 3177 Top flow Breccia red oxid ^{med to str} with med grey to red vesic clast v. broken and fract | clay on all surface in FB. |
| 274 | 3173'-3183.5' | v. broken Ext 80-90° | | 3183.5' - 3181' dk med grey non vesic. non porph. flow banding gives mottled appearance. Mn chlorit. of gneoms, less fract than F.B's but still v. broken | FeOx +/- limonite on 80-90° clasts |
| 275 | 3183.5'-3192' | v. broken & unconsol. | | 3181 - 3183.5' Basal Flow Breccia purplish grey non vesic w/ red oxid v. vesic small clasts (< 1cm) v. broken & fract. Basalt(?) 3183.5' (?) - 3193' Top flow Breccia - red oxid v. broken with re of oxid vesic, and grey non vesic clasts (mostly) matrix has tan ash color no phenos evident most clasts < 3cm few black size especially at base. 3193 - 3198' purplish red, more consolidated, smaller clasts, less closely spaced, rare plag crystals in matrix, clasts are still varied as before. 3198' - 3199' med grey unvesic, still has sm. (< 1cm) vesic dk grey clasts; mottled appearance | green/blue clay on surfaces |
| 276 | 3192'-3201' | 3192'-3195' broken to up @ 3198 Ext 80-90° | | 3199' - 3209' med. grey with "mottled" appearance from flow banding, non vesic, aphanitic (< 100µm) (med clay) Breccia (?) 3209' - 3231' tectonically brecciated and cemented with yellow clay +/- sulfur, Mn chlorite | hard limon/ FeOx on fract's |
| 277 | 3201'-3212' | 3201'-3205' Strg 60° med 30° 3205'-3209' Ext rand in all direct | | 3213-3218' fract + broken pieces of solid med. grey mottled clay with some yellow clay (?) that cemented intra-flow Breccia on fract's still fail | chlorite on fract's |
| 278 | 3212'-3222' | Ext. frac in all direc 0° predominant. | | Non vesic @ 3218-3219 vesic + v. broken w/ much limonite on surface | chlorite on fract's |
| 279 | 3222'-3231' | med 0-30° Strg 90° | | 3219' - 3228' Basal flow Breccia (?) non vesic v. frac + broken dk grey to purplish grey; v. porph. plag - 1/10 to 1/20 clasts v. lg (< 10cm) of various comp some dk grey vesic of similar comp as above flow; some flow breccia with clasts of its own (looks like it is from next flow down) | oxid Pyrr ~ 10% + blue clay on fract's |
| 280 | 3231'-3240' | med 0-20° mostly frac + unconsol. | | 3229' - 3231' tuff/agglomerate / lapilli to block size med dk grey vesic, porph, plag with pink orange matrix | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|---------------|-----------------------------------|----------------|--|---|
| | | | | Basaltic 3229' - 3235' Flow Breccia (?): brn-grey v. altered (even plag. w/ v. altered) porph. plag ~ 10% Oliv (?) ~ 10% (phenos diff. no def because of ext. clay alter.) | mmr Qtz + cl veinlets much lt blue + gm clay on all surfaces |
| | | | | 3235' - 3237.5' Dike dk grey to blk; vitreous "waxy" appearance, ^{mildly} tectonically brecciated and recemented. non vesic | " |
| 281 | 3240' - 3250' | rand Ext frac. in all direct. | | 3237.5' - 3244' Basaltic Andesite: dk grey of porph phenos ~ 10% (< 5mm) chlorite rims at 3241.5' becomes altered due to underlying dike - much lt blue clay on this section 3244' - 3248' Dike dk grey to blk waxy vitreous tectonically brecciated + recement. grad. contact with underlying units (last 5 feet) non vesic 3248' - 3251' agglomer. red orange ox. matrix w/ various clasts - all usually Basaltic, but varying in size, texture vesicular; no sorting; some appear to be obsidian, all are non porph. | mmr cc |
| 282 | 3250' - 3260' | rand Ext fract | | 3251' - 3314' Basaltic Andesite (?) (no top flow Breccia evid.) 3250' - 3254' pink grey to dk grey mod vesic w/ mmr yellow clay in vesic. tan clay vesic. elong. horizon. non porph. black waxy" appear. w/ red FeOx alter in stripes 3254' - 3268' v. vesic with ext. yellow clay in all vesic + cover all fract including on flow lines give some "platy" appearance. This entire section is v. broken + fract. 3268' - 3269' Basal Flow Breccia Basaltic Andes (?) 3269' - 3314' red oxid still v. vesic + much yellow clay 3269' - 3272.5' Top Flow Breccia v. broken and fract some evid of clasts (difficult to dist. because of broken condition) ~ v. vesic. | zeolites vesic. similar w/ evid of clasts |
| 283 | 3260' - 3272' | rand broken direct in all direct. | | 3272.5' - 3281' ext. broken, some sect tectonic. fract + recement. v. vesic w/ mottled app. Ext yellow clay on all surfaces + vesicles matrix is red oxid to 3274' then dk grey (yellow clay present throughout) med grey non porph | |
| 285 | 3281' - 3292' | v. broken + fract | | 3281' less yellow clay - more chlorite ext, still v. fract w/ red + yellow oxid following flow lines, mottled appearance non vesic. | zeolites + mmr cc in vesic |
| 286 | 3292' - 3303' | v broken + direct in all direct | | same w/ less alterat. | |
| 287 | 3303' - 3317' | Ext. 0° frags "platy" | | same except flow lines + mottling are longer + more fract's (0°) | strong red FeOx on 0° frags |
| 288 | 3317' - 3320' | v. broken (not as ext. as before) | | 3317' - 3318' Basal Becc dk grey w/ blk to dk grey clasts (appear to be from underlying unit) some clasts look like obsidian? no oxid | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-------------------|--|----------------|--|---------------------------|
| | | | | Basalt(?) 3314 - 3315' Bas. and porph plaq ~ 10% dk grey. olw < 1% mnr ironite | |
| | | | | 3315 - 3320' dk grey non porph altered surfaces (dike) waxy stuff (?) few frags | blaxy waxy clonon |
| 289 | 3320' - 3329' | v. broken + fract. | | 3320' - 3322' blk non porph, non vesic Flow Breccia B-A dk grey | |
| | | | | 3322' - 3336' v. broken w/ much clay on most surfaces Possible Flow Breccia (vesic, even darker) grey clasts vesic (no oxid at all present, similar to 3315-3320') blue or green clay on fract + invesic. | lt. blue clay on surfaces |
| 290 | 3329' - 3338.5' | same | | 3336' - 3363' dk to med grey with lt green clay on fract + invesic. Sl vesic (vesic < 2mm); non porph. (<< 1% plaq) | |
| 291 | 3338.5' - 3347.5' | mod 0° - 20° sev frac zones | | same | |
| 292 | 3347.5' - 3357' | mod to strg 0-40° | | same except non vesic or rare vesic (< 2mm) non porph | |
| 293 | 3357' - 3365' | mod 0° - 20° 3363-3366' frac in all dire | | @ 3357' flow becomes intermitantly porph plaq ~ 10% (< 3mm); and becomes lighter grey @ 3363 - 3364' Basal Flow Breccia, mid grey non vesic mottled w/ sm. vesic clasts (< 3mm) appears to be non porph w/ green clay on fract v. fract + broken | poor core recovery |
| 294 | 3365' - 3374' | randomly frac | | 3364' - 3438' Basaltic Andesite (?) (v. viscous) 3364' - become v. dk grey to blk w/ waxy texture from porph plaq ~ 6% (< 1mm) v. broken up @ 3373 - 3378.5' | |
| 295 | 3374' - 3390' | randomly frac | | mottling gives appearance of possible flow breccia but prob. is flow center 3378.5' - 3412' Flow Breccia (intra flow Breccia) | grey clay on all surf. |
| 296 | 3390' - 3412' | rand in all direct | | 3405' 1/2 of waxy blk w/ iron red some green mass oxid 3412' frac in all dire occasionally porph; rare clasts (blk to dk grey) mostly non vesic | limon. on some surfaces |
| 297 | 3412' - 3425' | " | | 3412' - 3421.5' still frag but appears to be flow center (no waste + decrease in clay) (mottled appearance) porph plaq ~ 3% | |
| 298 | 3425' - 3444' | " | | 3421.5' - 3438' Flow Breccia again dk grey blk in a million little pieces vesic (waxy on some portions) | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Alteration |
|-------|-------------------|--|----------------|---|--|
| 299 | 3444'- 3453' | Ext. rand Fracs. | | 3438' - 3509 Basalt; 3438' - 3444.5' Top flow Breccia - pinkish red, v. broken, sl. vesic. med. grey elongated matrix clasts. porph. plag ~ 5% 3444.5' - 3508' dk. grey, v. f. gr. porph < 5% oliv << 1% | |
| | | | | FeOx alter on flow lines (~40°) gives ^{min} platy appearance. non vesic. v. frac. + broken | Ext. FeOx |
| 300 | 3453'- 3463.5' | mostly frac in rand dir. Ext. 0-90° mod | | same | ' |
| 301 | 3463.5'- 3473 | rand. frac, in all direct. | | yellow clay / FeOx on flow lines (~20°) | |
| 302 | 3473'- 3494.5' | " | | (only min) same - no FeOx, just much lt bluish grey clay | |
| 303 | 3494.5'- 3511 | " | | 3508-3509 Basalt (Breccia(?)) (v. poor core recov. 3506-3509) 3509'-3510' Lithic tuff - org ash matrix w/ dk grey mod. vesic. basaltic clasts. brkn up. | |
| 304 | 3511'- 3532.5 | " | | 3510' - 3529' Basalt (?) & 3510' - 3512' Top flow Breccia(?) brkn, v. red oxid. mod vesic (< 2mm) aphanitic 3512' - 3520 dk. grey; sl. vesic. spars, porph. plag ~ 3% ^{gr} frac (v. poor core recov. this section) 3520' - 3532. med grey mod vesic - amygduloidal w/ wt. clay + zeolites filling vesic | much FeO _x in FB, and in 3512-3520 round spheroidal zeolites in vesicles wht clay on fracs min chlorite on fracs. |
| 305 | 3532.5'- 3542' | Ext. 0-20° Strg 90° | | 3532' - 3729' med grey non vesic w/ clay on flow lines (~0-20°) causing fracs + platy look | |
| 306 | 3542'- 3551 | Ext 0-20° v. rand. frac in all direct | | same | limon, FeOx on fracs possibly MnOx? |
| 307 | 3551'- 3560' | Ext 0-30° Strg 90° v. rand frac | | same | increased chlorite on fracs or epidote(?) |
| 308 | 3560'- 3569' | Ext 0, 90° v. fract.! | | same | Ext chlorite on 90° fracs |
| 309 | 3569'- 3579' | " | | same | |
| 310 | 3579'- 3589 | but less frac than prev flow boxes | | same | |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | Exp. totally part of |
|-------|-------------------|--|----------------|--|---|
| 328 | 3751' - 3761' | strat 900 sand frac | | 3756' - 2762.5' v. f. gr. non porph, ^{rare} vesic.; dk grey amygdules w/ Cc | Cc, amygdules & filling vesic |
| | | | | 3762.5 - 3766 Flow Breccia - med grey broken, w/ much lt blue to wht. clay - non vesic & vesic clasts | in rinded cryst. v. mnri, celad. mnri. zeolites also coat thin Cc on fract. mnri. |
| 329 | 3761' - 3770.5' | mod 55° sev. v. brkn zns. | | 3766' - 2774 med. grey mod. vesic. non porph w/ Ext. Calcite, v. broken w/ well developed crystal | H. blue clay rounded, clay coated zeol. |
| 330 | 3770.5' - 3781' | mod. 0°-30° | | 3774 - 3778 same except dk. grey 3778 - 3784 same except non-vesic., and ∴ a decrease in Calcite (but still present) | in vesic. lt green clay |
| 331 | 3781' - 3791' | mod 0° to 3784 then rand frac + brkn. | | 3784' - 3791' Basal Flow Breccia? 3784 - 3787 v. brkn and vesic. 3787' to 3791' more consolidated but still vesic. med to dk grey rare clasts 3791' - 3805' well consolidated med grey matrix (non vesic non porph.) with dk grey non-to mod vesic clasts ranging from lapilli to block size. no grading or sorting - magnetically high heterolith. doesn't have flow characteristics! | Calcite in vesic. H blue clay coating |
| 332 | 3791' - 3800' | mod 0° | | | Ext |
| 333 | 3800' - 3809' | mod 0° to 3805' then v. brkn. | | 3805' - 3809' Basalt 3805' - 3809' Flow Breccia - med. grey non vesic matrix with dk grey vesic clasts | mnri MnOx (L) on fract. mnri. chon |
| 334 | 3809' - 3819' | mod 50°-70° few 90 | | 3809' - 3835.5' med grey non vesic. aphanitic | H blue clay on fract |
| 335 | 3819' - 3828' | 3819' - 3823 v. brkn mod 0° mod 80°-90° | | same except dk grey | |
| 336 | 3828' - 3837.5' | mod 0° mod 60°-70° | | same | mnri zeol. on fract. coated w/ yellow clay |
| | | | | 3835.5' - 3839.5 Basal Flow Breccia (C?) med grey tectonically brecciated + recement, much H blue clay & limonite on faces still v. frac (again after recement) | zeolites + disseminated |
| 337 | 3837.5' - 3846.5' | 3837-3839 brkn, mod 0° rest | | 3839' - 3842.5 Lahar? grey-brn mud/ash matrix w. heterolith clast - lapilli to bit size; red grey to med. grey vesic + non vesic no grading or bedding poorly sorted; occasional vitric pieces (obsidian) clasts are ang to subang, some clasts are porph, some not | Pyrite & other Sulfid minerals |
| | | | | 3842.5' - 3877 Andesite? or Basalt? 3842.5' - 3848.5' Flow Breccia - grey matrix with v. mnri, oxid qndms & vesic clasts some of precipitation appears to be tectonic + then recemented; clasts more oxid. than matrix, all sizes | grey clay clasts are porph |

| BOX # | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------|-------------------------------------|----------------|--|----------------------------------|
| 338 | 3846.5' - 3855' | rand fract in all dir | | 3848.5' - 3877' dk. grey mod. vesic. - vesic amygdulared w/ calcite & lt. blue clay sparsely porph. plag < 1%, pyr. < 1% | Calcite in vesic. |
| 339 | 3855' - 3868.5' | | | | min. rounded zeolites |
| 340 | 3868.5' - 3874' | Ext 0° 90° strg 65° | | Same Calcite as thin coat on frags. 3874' - 3876' v. extensively frags. | |
| 341 | 3874' - 3883' | 3874.6' - 3876' Ext. 0° | | 3876' - 3877' Basal flow Breccia dk. grey with vesic clasts (much lt. blue clay on all surfaces) | grey |
| | | | | 3877' - 3924.5' Basalt or Andesite? ; 3877' - 3888.5' | |
| | | | | Top flow Breccia: red grey oxid grading to med bn-grey to med. grey, w/ vesic oxid. clasts; Calcite filling vesicles sparsely porph; plag ~ 3% and dk grey | |
| | | | | 3888.5' - med grey. rare vesicles, sparsely porph. - pyrox (?) < 3% plag < 1% v. frags. + brkn. | MnOx (?) + lt blue clay on frags |
| 342 | 3883' - 3893' | mod. 0° few to 5° sev. or brkn zns. | | @ 3893 much FeO _p (red) on frags. | |
| 343 | 3893' - 3902' | strg 90° med to strg 50° | | @ 3898.5' gndms. becomes chloritized. | |
| 344 | 3902' - 3911' | strg 90° med. 0° - 20° | | same | |
| 345 | 3911' - 3920' | strg to Ext. 90° | | same except muddly tacton. brecciated + recrystallized phenos decrease pyr < 1% plag < 1% | |

| * BOX | Box interval | FRACTURES | Graphic Symbol | GEOLOGIC DESCRIPTIONS | |
|-------|-----------------------------|---|----------------|---|---|
| 346 | 3920' - 3930' | mod 0°-30° str 90° brkn. - 3928-3930' | | 3924' - 3924.5 Basal Flow Breccia - med. grey, crumbly w/ vesic. acid clasts | str FeOx on 90° fracs |
| 347 | 3930' - 3939' | mod 0°-40° | | 3924.5' - 3939' Andesite (?) 3925' - 3930' Top flow breccia - q. red oxid. (broken) mildly vesic matrix w/ v. red, v. vesic clasts | Ext blue clay on all surfaces |
| | | | | 3930' - 3932' red oxid v. vesic; (nodules visible) | |
| | | | | 3930' - 3939' brn grey to dk. grey; non vesic 1" of basal flow breccia | much blue clay in vesic. amygdules w/ calcite |
| 348 | 3939' - 3948.5' | mod 0°-30° sev. brkn. zones | | 3937 - 3969 Andesite (?) 3939' - 3946' - Top flow Breccia (?) | FeOx, blue clay |
| | | | | red oxid matrix sli. to mod. vesic., rare clasts mod. brkn. | on fracs + vesic |
| 349 | 3948.5' - 3958' | mod. 0°-20° few 90° | | 3946' - 3967 dk grey sli vesic., no phenos visible | |
| | | | | mildly oriented red gmdms. (?) 3967' - 3969' Basal flow Breccia - v. broken med grey - | Calcite amygdules zeolites in vesic |
| 350 | 3958' - 3967' | mod 0°-20° | | Same red | |
| 351 | 3967' - 3976' | 3967-3971 v. brkn 3971-3976 mod 0°-20 few 90° | | 3969 - 3984' Andesite 3969' - 3973' Top flow breccia - grey brn. matrix w/ red oxid v. vesic. clasts | blue wht. clay in fracs and in vesic. |
| | | | | mostly broken. 3973 - 3980' red oxid mod. vesic non vesic non porph (< 10 cm) | |
| 352 | 3976' - 3985' | mod 0°-30° | | mod. brkn. dk | |
| | | | | 3980 - 3984 dk grey w/ mildly oxid gmdms, few vesic. (amygduloidal clay + calcite) | |
| | | | | 3984' - 4002 (?) ^{TD} Andesite 3984' - 3989' Top Flow Breccia (?) | blue clay in vesic |
| | | | | v. broken, red oxid. mod to v. vesic. non - (< 5 cm) | green |
| 353 | 3985' - 3994' | v. brkn. to 3989' then mod 0°-30° | | 3989' - 4002' sli. vesic. red grey to dk. grey non porph | Ext. spher |
| | | | | mildly oxid. gmdms. vesic. are large | zeolites in vesics |
| 354 | 3994' - 4002' ^{TD} | mod. 0°-50 Ext. 90° sev. brkn zones | | | Ext FeOx on 90° fracs at 3945' - 3999 |



Thin section sampled → GEO N-3

Depth

Lithology?

| Depth | Lithology? |
|----------|-------------------------------|
| ① 475.5 | Basaltic Andesite |
| ② 711.5 | Basaltic Andesite |
| ③ 772 | Basalt (?) |
| ④ 840 | Andes. or Basaltic Andesite ? |
| ⑤ 924.5 | Basaltic Andesite |
| ⑥ 1214 | |
| ⑦ 1281 | |
| ⑧ 1537 | |
| ⑨ 1586.5 | |
| ⑩ 1705 | |
| ⑪ 1775 | |
| ⑫ 1962.5 | |
| ⑬ 2193 | |
| ⑭ 2307 | |
| ⑮ 2397 | |
| ⑯ 2539 | |
| ⑰ 2882 | |
| ⑱ 2769 | |
| ⑲ 2966.5 | |
| ⑳ 3047 | |
| ㉑ 3203 | |
| ㉒ 3241 | |
| ㉓ 3314.5 | |
| ㉔ 3352 | |
| ㉕ 3415 | |
| ㉖ 3597 | |
| ㉗ 3769.5 | |
| ㉘ 3838.5 | |
| ㉙ 3892 | |
| ⑳ 1061 | |
| ㉑ 1300 | |
| ㉒ 1332 | |
| ㉓ 1434 | |

22-141 50 SHEETS
22-142 100 SHEETS
22-144 200 SHEETS



skeleton Core Box # | Depth | Box # | Description | Thin section

| | | | | |
|--|---------|----|--|---|
| | 475.5 | 3 | Basaltic Andesite | ✓ |
| | 508 | 6 | Basaltic Andesite | |
| | 538 | 9 | Lapilli Tuff - heterolithic lapilli | |
| | 615 | 15 | dsh. + scoria - homogeneous lapilli | |
| | 711.5 | 23 | Basaltic Andesite | ✓ |
| | 721 | 24 | cinders ash + scoria | |
| | 752 | 28 | Basaltic Andesite | |
| | 763 | 28 | airfall tu f f | |
| | 772 | 29 | Basalt (?) v. vesic, 2 samp | ✓ |
| | 800 | 32 | Basalt (?) non vesic } flow | |
| | 803-805 | 32 | Cinders and ash | |
| | 807.5 | 33 | Basaltic Andesite | |
| | 830 | 35 | Andesite or Basaltic And (?) } samp | |
| | 840 | 36 | Andesite or Basaltic And (?) } flow | ✓ |
| | | | minor zeolites on frags | |
| | 865 | 39 | Lithic Tuff | |
| | 875 | 40 | agglomerate | |
| | 924.5 | 44 | Basaltic Andesite | ✓ |
| | 991 | 51 | agglomerate | |
| | 1011 | 53 | Bas. And. Top flow Breccia } samp | |
| | 1024 | 54 | Bas. And. Flow center } flow ? | |
| | 1034.5 | 56 | ash and cinders | |
| | 1044 | 56 | volcaniclastic | |

| | | | | |
|--------------------|--------|-----------------------------|--|-------------------|
| skel. core Box # 2 | 1061 | 58 | Basaltic And. or Basalt (?) } samp | ✓ |
| | 1089 | 60 | " " } flow | |
| | | | w/ acicular, v. fine zeolites on top frag. | |
| | 1124 | 63 | Bas. And. Top flow Breccia (lg. black in Breccia) | |
| | 1166 | 67 | Bas. And. Flow center | |
| | 1170 | 68 | Basaltic And. - glomerophy. (interesting lg. frag megacryst) | |
| | 1176.5 | 68 | Bas. and Basal Flow Breccia | |
| | 1181 | 69 | } Top flow Breccia | |
| | 1190 | 70 | | Basaltic andesite |
| | 1214 | 72 | Basaltic And. Flow center (?) | ✓ |
| | 1218 | 73 | intra flow Breccia ? | |
| | 1227 | 73 | Bas. And Flow center | |
| | 1233 | 74 | Bas. And intra flow breccia | |
| | 1246 | 75 | Bas. And. - ex. of sev. par. frags. in this Box | |
| | 1249.5 | 75 | } Flow Breccia ? | |
| 1258 | 76 | (1261 - block in Breccia) | | |
| 1261 | 77 | | | |
| 1267 | 77 | | | |
| 1274 | 77 | volcaniclastic or Lahar (?) | | |

22-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS



| Depth | Box # | Description | Thin section |
|------------------------|--------|--|----------------|
| 1278.5 | 78 | Andesite Top flow Breccia? | |
| 1281.5 | 79 | Andesite flow center | ✓ |
| 1283 | 79 | Basal Flow Breccia | |
| 1288.5 | 79 | Top flow Breccia(?) | |
| 1289.5 | 80 | Lapilli tuff | |
| 1293 | 80 | { ash + cinders | |
| 1296 | 80 | | |
| 1300 | 81 | Andesite | ✓ |
| 1302 | 81 | volcaniclastic(?) | |
| 1314 | 82 | Andesite Topflow Breccia | |
| Skeleton core Box 3 | 1324 | Andesite Top flow Breccia? (lg. block) | |
| | 1332 | Andesite | ✓ |
| | 1336 | And. Basal Flow Breccia | |
| | 1340 | And. Top Flow Breccia | |
| | 1351 | And. Flow Center | |
| | 1355 | And Basal Flow Breccia | |
| | 1359 | And Top Flow Breccia | |
| | 1362.5 | And. Top Flow Breccia (lg. block) | } Simp Flow |
| | 1372 | And. Top Flow Breccia | |
| | 1385 | And. Flow Center unoxid grndms | } Simp Flow |
| | 1403.5 | And. Flow Center oxid grndms | |
| | 1434 | And. Flow Center | ✓ |
| | 1469 | And. Basal Flow Breccia | |
| | 1481 | And. Top Flow Breccia | |
| | 1499 | Andesite - note par. ~40° fracs. | |
| | 1509 | Basal flow Breccia | |
| | 1514 | Top flow Breccia (andesitic) | |
| | 1537 | Andesite Flow Center | ✓ |
| | 1554 | Andesite Flow Center | |
| | 1571.5 | Ext. zeolite (small but fairly well developed) in vesicles | |
| | 1564.5 | And. Basal Flow Breccia Ext. small zeolites in vesic. | |
| | 1576.5 | And. Top Flow Breccia | |
| | 1586.5 | And. Flow Center | ✓ |
| | 1611 | cinders | |
| | 1618 | agglomerate | |
| | 1637 | scoria | |
| | 1659.5 | Lapilli Tuff | |
| | 1672.5 | Bas. And. Topflow Breccia | |

22-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS



| Depth | Box # | Description | Thin section? | |
|---------------|--------|----------------------------|--|---|
| 1705 | 123 | Basal. And. Flow Center | ✓ | |
| 1733 | 126 | Lapilli Tuff | | |
| 1735 | 126 | volcanoclastic(?) | | |
| 1740 | 126 | Lapilli tuff | | |
| 1744 | 127 | Agglomerate | | |
| 1753 | 128 | Bas. And. Top flow Breccia | | |
| 1775 | 130 | Bas. And. Flow Center | ✓ | |
| 1780 | 131 | Ash + anders | | |
| 1787 | 131 | Flow Breccia(?) | | |
| 1789.5 | 132 | Crystal lithic tuff | | |
| 1792 | 132 | Basalt(?) | | |
| 1796.5 | 132 | ash flow | | |
| Skeleton Core | | | | |
| Box 4 | 1820 | 135 | agglomerate | |
| | 1861 | 139 | Breccia Flow(?) (Bas. And) | |
| | 1886 | 141 | Ash + anders | |
| | 1925.5 | 144 | Andesite Top flow Breccia | |
| | 1962.5 | 149 | Andesite Flow Center | ✓ |
| | 2017 | 155 | " with typical 90° frac with hard clay | |
| | 2050 | 159 | Andesite-reloxid Flow Center | |
| | 2093 | 163 | Andesite- " " | |
| | 2109 | 165 | Andes. Top Flow Breccia | |
| | 2144 | 169 | Andes. showing par. 0° frac present in entire box | |
| | 2193 | 174 | Andesite flow center | ✓ |
| | 2259 | 180 | Andesite flow center | |
| | 2281.5 | 183 | Andesite flow center | |
| | 2307 | 185 | Bas. And. or And(?) | ✓ |
| | 2363 | 191 | Bas. And. or And | |
| | 2371 | 192 | Andesite flow center (oxid.) | |
| | 2397 | 193 | And. flow center (unoxid.) | ✓ |
| | 2409.5 | 196 | And. flow Breccias | |
| | 2413.5 | 196 | volcanoclastic | |
| | 2442 | 199 | Andesite | |
| | 2451 | 200 | ash flow | |
| | 2452 | | | |
| | 2455 | | | |
| | 2497.5 | 204 | Lapilli Tuff | |
| | 2520 | 206 | Lithic Lapilli tuff (possible ash flow?) | |
| | 2539 | 208 | Basaltic Andesite | ✓ |
| | 2587.5 | 213 | Basaltic Andesite (zeolites in vesic.) | |
| | 2605 | 214 | agglomerate | |

22-141 50 SHEETS
 22-142 100 SHEETS
 22-144 200 SHEETS



| | Depth | Box # | Description | Thin section Y/N? |
|--------------------------|--------|--|--|-------------------|
| | 2644 | 218 | Basaltic Andesite (?) w/ chlor. of matrix | |
| | 2686 | 222 | Basaltic Andesite (?) | |
| | 2769 | 231 | Basaltic Andesite (?) | ✓ |
| | 2819 | 236 | Basaltic Andesite (?) | |
| skeleton core Box # 5 | 2844 | 239 | Basaltic Andesite (?) | |
| | 2856 | 240 | Lahar | |
| | 2868 | 241 | Andesite - calcite amygdules | |
| | 2872.5 | 241 | Andesite - calcite on fract phenocryst - pyrox? | |
| | 2882 | 243 | Andesite - typical of 90° fracs in this unit, calcite, clay + MnOx? | ✓ |
| | 2900 | 245 | Agglomerate | |
| | 2925 | 247 | Basaltic Andesite | |
| | 2929 | 248 | Lahar | |
| | 2930.5 | 248 | Basaltic Flow Breccia | |
| | 2931 | 248 | volcaniclastic | |
| | 2934 | 248 | Agglomerate | |
| | 2966.5 | 252 | Basalt? Andesite? chlorit. gmdms | ✓ |
| | 3002 | 255 | Basal Flow Breccia | |
| | 3011.5 | 256 | agglomerate | |
| | 3023 | 257 | Basalt? Calcite on fracs | |
| 3047 | 260 | Basalt? Calcite amygdules | ✓ | |
| 3103 | 266 | Basal Flow Breccia much calcite on fractures | | |
| 3120.5 | 268 | ash flow | | |
| 3124.5 | 268 | ash flow | | |
| 3128 | 269 | ash flow | | |
| 3143 | 270 | lahar (?) | | |
| 3156 | 272 | agglomerate | | |
| 3171 | 272 | Flow Breccia | | |
| 3180 | 274 | Basalt | | |
| 3184.5 | 275 | Top flow Breccia | | |
| 3203 | 277 | Basaltic Andesite? | ✓ | |
| 3212.5 | 278 | intra flow breccia - tectonically brecciated + recemented | | |
| 3217 | 278 | Basaltic And. (?) (typical of this flow) | | |
| 3222.5 | 279 | Basal flow Breccia what are brn. pheros? | | |
| 3234.5 | 280 | Flow Breccia | | |
| skel. core #6 | 3236 | 280 | Dike? | |
| | 3241 | 281 | Basaltic Andesite | ✓ |
| | 3246 | 281 | Dike? | |



| Depth | Box # | Description | Thin section Y/N? |
|--------|-------|--|-------------------|
| 3249.5 | 281 | agglomerate | |
| 3260 | 282 | Basaltic Andesite? | |
| 3280 | 284 | Basaltic Andesite? | |
| 3313 | 288 | Basal Flow Breccia | |
| 3314.5 | 288 | Basaltic Andesite? | ✓ |
| 3320.5 | 289 | Dike? | |
| 3332 | 290 | Flow Breccia | |
| 3352 | 292 | Basalt or Basaltic Andesite(?) | ✓ |
| 3361 | 293 | Dike? | |
| 3364.5 | 294 | Dike } Glassy | |
| 3374.5 | 295 | Dike } margin | ✓ |
| 3399 | 296 | Flow Breccia | |
| 3405 | 296 | Flow Breccia? | |
| 3415 | 297 | Basalt? | ✓ |
| 3423 | 297 | similar Flow Breccia | |
| 3449 | 299 | Basalt? | |
| 3525.5 | 304 | Basalt with amygdules with zeolites and wht. clay | |
| 3536.5 | 305 | Basalt - note flow lines with alter. on 0° fracs | |
| 3589 | 310 | Basalt - what is alter. on 0° fracs | |
| 3597 | 311 | Basalt - what is green min.? | ✓ |
| 3604.5 | 312 | Basalt - note Calcite on 90° fracs | |
| 3635 | 315 | Basalt - what is alter. on 0° fracs | |
| 3692 | 322 | Basalt | |
| 3741 | 326 | ash flow | |
| 3742 | 326 | ash flow - vitrofier | |
| 3744.5 | 327 | Top flow breccia | |
| 3769.5 | 329 | Basalt - well develop. Calcite crystals | ✓ |
| 3770 | 330 | Basalt - much Calcite | |
| 3776 | 330 | Basalt - lg. Calcite crystals on top + base / zeolites | |
| 3796 | 332 | Lahar or flow breccia - Calcite in vugs / much Calcite | ✓ |
| 3833.5 | 336 | Basalt | |
| 3840.5 | 337 | Lahar? | |
| 3838 | 337 | Basal Flow breccia - disseminated pyrite | |
| 3863.5 | 339 | Basalt or Andesite - Calcite amygdules | |
| 3892 | 242 | Andesite? phenos. pyr? | ✓ |
| 3948 | 348 | Andesite - large Calcite crystal | |
| 4000 | 354 | Basalt or Andesite? large Calcite crystal | |

1-811-4100

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FORM 47-50M 5-83

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UNIVERSITY OF UTAH RESEARCH INSTITUTE

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Sept. 21, 1987

PURCHASING DEPARTMENT
Salt Lake City, Utah 84108
Telephone (801) 524-3422S. H. Kohler Co.
P.O. Box 41
306 Junction Street
Orangville, ID 23530BREAKAGE, DAMAGES, SHORTAGES,
OVERAGES, ETC., SHOULD BE NOTED AND
RETURNED WITH THIS FORM TO RECEIVING
DEPT. WITHIN 5 DAYS.

| Quantity | DESCRIPTION | Dept. Est. Price \$ 100.00 |
|----------|---------------|----------------------------|
| 31 | This section. | |

✓ AT LEFT OF QUANTITY INDICATES ITEM(S) SHIPPED

○ AT LEFT OF QUANTITY INDICATES ITEM(S) BACK ORDERED

DATE REC'D. / / 19 TIME A.M. P.M.

PACKING SLIP NO. RECEIVED AND INSPECTED BY

ARRIVED VIA

THEIR TRUCK PARCEL POST PREPAID OUR TRUCK EXPRESS COLLECT

FREIGHT COMPANY

BILL NO.

 COMPLETE INCOMPLETE

NUMBER OF PIECES

RECEIVED IN DEPT.

BY

samples out of skel. core

for X-ray + fluid inclusion

2882'

2872.5'

3776'

1554'

1564.5'