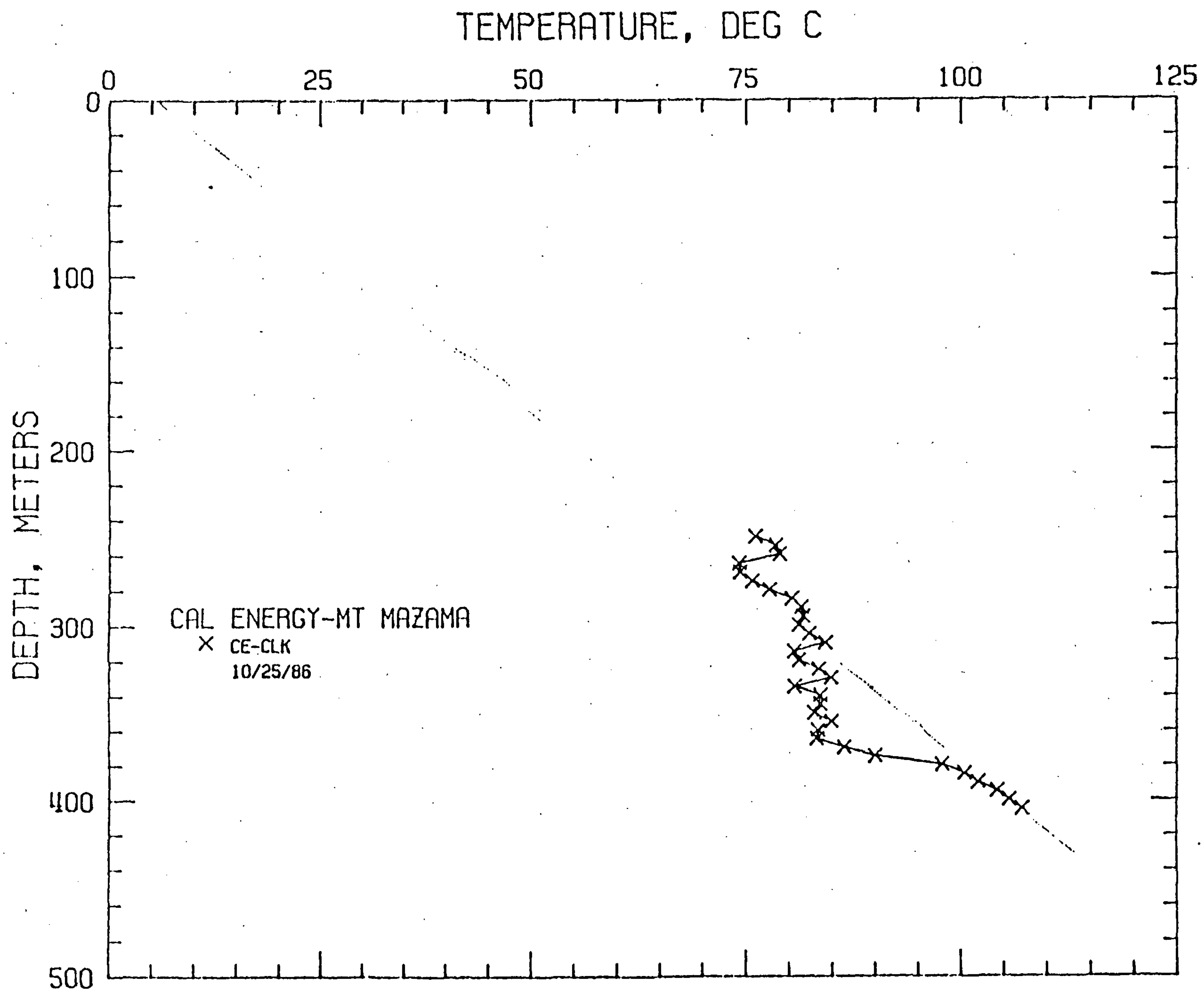
GL01900

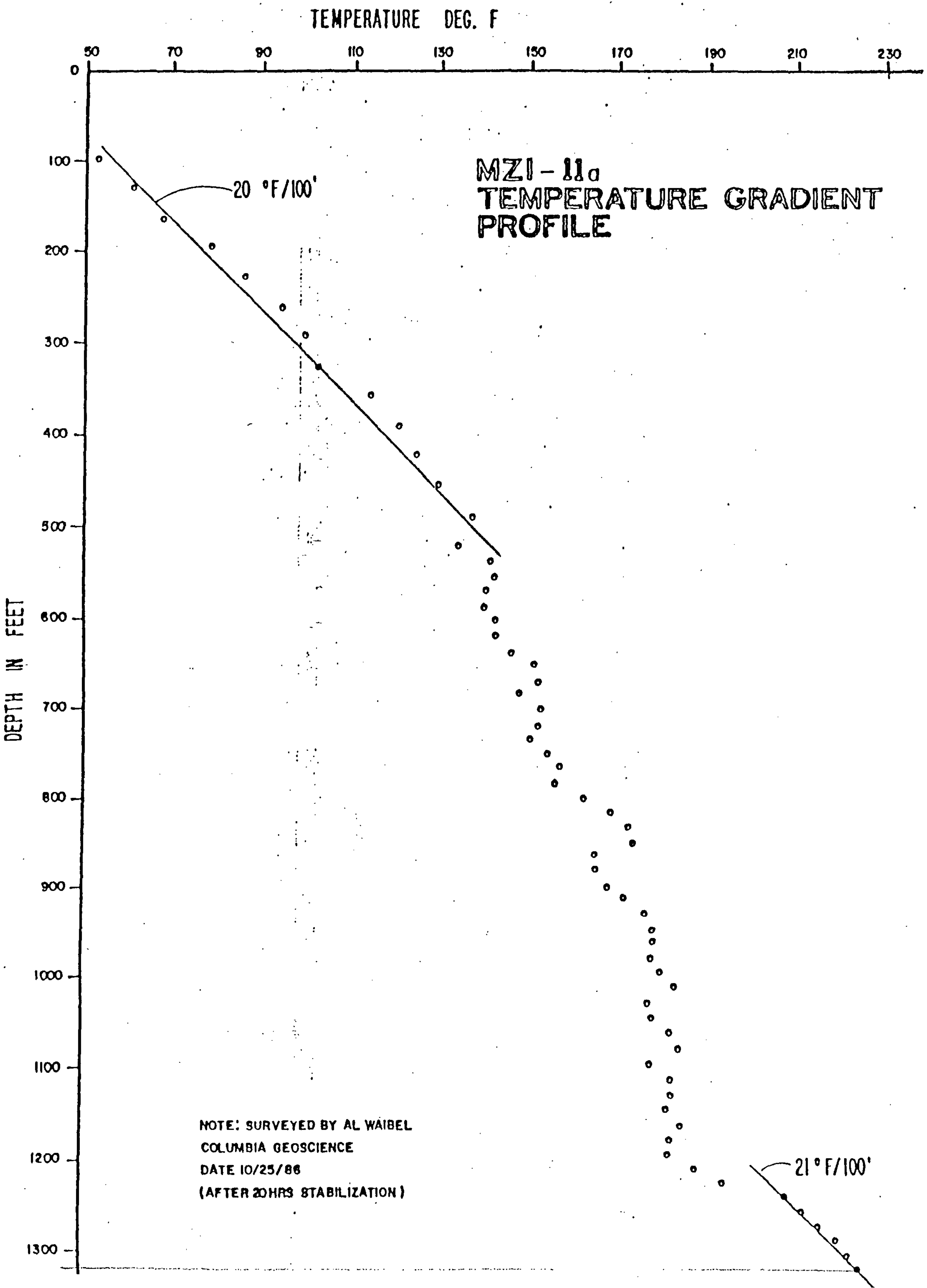
LOCATION: KLAMATH FALLS AMS, ORE
T/R-S:
HOLE NAME: MZI-11A
DATE MEASURED: 10/25/86

DEPTH	DEPTH	TEMPERATURE		GEOTHERMAL GRADIENT	
METERS	FEET	DEG C	DEG F	DEG C/KM	DEG. F/100 FT
250.0	820.2	76.100	168.98	0.0	0.0
255.0	836.6	78.500	173.30	480.0	26.3
260.0	853.0	78.900	174.02	80.0	4.4
265.0	869.4	74.200	165.56	-940.0	-51.6
270.0	885.8	74.300	165.74	20.0	1.1
275.0	902.2	75.700	168.26	280.0	15.4
280.0	918.6	77.700	171.86	400.0	22.0
285.0	935.0	80.300	176.54	520.0	28.5
290.0	951.4	81.400	178.52	220.0	12.1
295.0	967.8	81.600	178.88	40.0	2.2
300.0	984.3	81.100	177.98	-100.0	-5.5
305.0	1000.7	82.300	180.14	240.0	13.2
310.0	1017.1	84.200	183.56	380.0	20.9
315.0	1033.5	80.600	177.08	-720.0	-39.5
320.0	1049.9	81.100	177.98	100.0	5.5
325.0	1066.3	83.400	182.12	460.0	25.2
330.0	1082.7	84.800	184.64	280.0	15.4
335.0	1099.1	80.600	177.08	-840.0	-46.1
340.0	1115.5	83.600	182.48	600.0	32.9
345.0	1131.9	83.600	182.48	0.0	0.0
350.0	1148.3	82.900	181.22	-140.0	-7.7
355.0	1164.7	84.900	184.82	400.0	22.0
360.0	1181.1	83.300	181.94	-320.0	-17.6
365.0	1197.5	83.200	181.76	-20.0	-1.1
370.0	1213.9	86.400	187.52	640.0	35.1
375.0	1230.3	90.000	194.00	720.0	39.5
380.0	1246.7	97.800	208.04	1560.0	85.6
385.0	1263.1	100.400	212.72	520.0	28.5
390.0	1279.5	102.000	215.60	320.0	17.6
395.0	1295.9	104.200	219.56	440.0	24.1
400.0	1312.3	105.600	222.08	280.0	15.4
405.0	1328.7	107.100	224.78	300.0	16.5

Data from Dave Blackwell's Computer Program.



Data Plot From
Dave Blackwell



MZI - 11a TEMPERATURE GRADIENT PROFILE

NOTE: SURVEYED BY AL WAIBEL
COLUMBIA GEOSCIENCE
DATE 10/25/86
(AFTER 20HRS STABILIZATION)

MZI-11A.
CORE RECOVERY

Depth Interval	Cut	Recovered	% Recovered
575'-579'	4	4	100%
579'-585'	6	6	"
585'-589'	4	4	"
589'-594'	5	5	"
594'-596'	2	2	"
596'-604'	8	8	"
604'-614'	10	10	"
614'-624'	10	10	"
624'-634'	10	10	"
634'-644'	10	10	"
644'-654'	10	10	"
654'-663'	9	9	"
663'-673'	10	10	"
673'-683'	10	10	"
683'-693'	10	10	"
693'-694'	1	1	"
694'-704'	10	10	"
704'-714'	10	10	"
714'-724'	10	10	"
724'-734'	10	10	"
734'-744'	10	10	"
744'-754'	10	10	"
754'-764'	10	10	"
764'-772'	8	8	"
772'-782'	10	10	"
782'-792'	10	10	"
792'-801'	9	9	"
801'-811'	10	10	"
811'-820'	9	9	"
820'-830'	10	10	"
830'-840'	10	10	"
840'-850'	10	10	"
850'-856'	6	6	"
856'-861'	5	5	"
861'-871'	10	10	"
871'-873'	3	2	67%
873'-882'	9	9	100%
882'-892'	10	10	"
892'-897'	5	5	"
897'-907'	10	10	"
907'-914'	7	7	"
914'-924'	10	10	"
924'-934'	10	10	"
934'-944'	10	10	"
944'-954'	10	10	"
954'-964'	10	10	"

Depth Interval	Cut	Recovered	% Recovered
964'-974'	10	10	100%
974'-984'	10	10	"
984'-994'	10	10	"
994'-1004'	10	10	"
1004'-1006'	2	2	"
1006'-1014'	8	8	"
1014'-1024'	10	10	"
1024'-1032'	8	8	"
1032'-1042'	10	10	"
1042'-1052'	10	10	"
1052'-1058'	6	6	"
1058'-1061'	3	3	"
1061'-1069'	8	8	"
1069'-1079'	10	10	"
1079'-1084'	5	5	"
1084'-1086'	2	2	"
1086'-1096'	10	10	"
1096'-1106'	10	10	"
1106'-1108'	2	2	"
1108'-1118'	10	10	"
1118'-1128'	10	10	"
1128'-1138'	10	10	"
1138'-1147	9	9	"
1147'-1150'	3	3	"
1150'-1154'	4	4	"
1154'-1162'	8	8	"
1162'-1164	2	2	"
1164'-1174'	10	10	"
1174'-1184'	10	10	"
1184'-1194'	10	10	"
1194'-1204'	10	10	"
1204'-1209	5	5	"
1209'-1219'	10	10	"
1219'-1225'	6	6	"
1225'-1234'	9	9	"
1234'-1244'	10	10	"
1244'-1250'	6	6	"
1250'-1259'	9	9	"
1259'-1263'	4	3	75%
1263'-1268'	5	4	80%
1268'-1278'	10	10	100%
1278'-1287'	9	9	"
1287'-1297'	10	10	"
1297'-1307	10	10	"
1307'-1315'	8	8	"
1315'-1324'	9	9	"
1324'-1334'	10	10	"
1334'-1344'	10	10	"
1344'-1354'	10	10	"

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Hole MZI-11A

Cuttings Review

0-10 ft.

75% Beige, variably devitrified, pumice.
25% Subrounded to rounded mixed lithic igneous fragments.
Tr. sub-mm fragments of feldspar, hornblende and pyroxene are present.

10-20 ft.

a/a.

20-30 ft.

100% Light brown volcanic pebble congleromate. Matrix consists of devitrified pumice, sand size lithic fragments, and feldspar, hornblende, and pyroxene crystal fragments. The coarser fraction consists of angular to subrounded volcanic lithic fragments (rhyodacite?) and rounded devitrified pumice fragments. Note: Traces of dark red to orange red in matrix maybe cinnabar or hematite.

30-40 ft.

a/a

40-50 ft.

100% Mixed volcanic fragments, including angular to subrounded gray rhyodacite (?) and red to orange-brown tuff.

50-60 ft.

90% Gray to dark gray, scoriaceous to dense, hypocrystalline basaltic andesite. The more dense fragments show loss of orignal texture due to metasomatic alteration. The pyroxene crystals are generally fresh with minor hematite alteration around the edges.
10% Mixed tuffaceous fragments.

60-70 ft.

a/a with minor light colored clay alteration and black hydrous Fe oxide precipitation along occassional fracture surfaces.

70-80 ft. Unwashed Sample

This sample consists of abundant red and gray clay and sand size crystal and lithic fragments. Coarser pebble sized fragments consist of lava and pumice clasts. It is difficult to determine how much of the coarser fraction is slough from up hole or how much of the clay and sand fraction is recycled drilling fluid.

80-90 ft. "Fine mud, driller couldn't catch sample."

Predominantly reddish clay and silt, sand size crystal and lithic fragments, and pebble size mixed volcanic fragments.

90-100 ft.

2% Dark gray scoriaceous basaltic andesite.

98% Red to gray, strongly hematite stained, locally vesicular andesite. Mafic minerals are strongly oxidized, with much of the orignal crystal morphology lost. The feldspar phenocrysts are variably altered to clay and possibly zeolite, and are often stained red from secondary hematite.

100-110 ft.

20% a/a.

80% Poorly lithified and strongly clay-altered scoriaceous to tuffaceous fragments with abundant secondary reddish hematite.

110-120 ft.

a/a

120-130 ft.

a/a

130-140 ft.

a/a. Note: Possible pipe dope in sample.

140-150 ft.

a/a

150-160 ft.

55% Brown to red devitrified basaltic tephra.

45% Red to gray strongly hematite and clay-altered basaltic lithic fragments.

160-170 ft.

60% red to gray strongly hematite- and clay-altered basaltic lithic fragments.

40% Brown to red devitrified basaltic tephra.

170-180 ft.

100% Red, locally gray, strongly hematite- and clay-altered basaltic lithic fragments.

180-190 ft.

100% Red-brown to gray strongly hematite- and clay-altered basaltic lithic fragments.

190-200 ft.

a/a

200-210 ft.

100% Red to dark gray, locally light green-gray, strongly clay altered basalt(?). Reddish color is due to secondary hematite staining. The green color is due to reduced Fe-bearing secondary clay (smectite?).

210-220 ft.

100% Light green-gray to dark green-gray clay altered dacite(?) with minor local red to orange hematite staining. Fresh sub-mm secondary pyrite crystals are common throughout the green-gray clay-altered rock.

220-230 ft.

100% Light green-gray, locally dark gray, strongly clay-altered dacite(?). Clear to milky precipitated cryptocrystalline silicia is common throughout the fragments. Sub-mm black magnetite crystals are present, possibly as a surviving relic of the host rock. Sub-mm secondary pyrite is irregularly distributed through rock fractures, occasionally occurring as mm-size clusters. Minor clear tabular zeolite clusters are present in occasional vesicles and open fractures. Locally fine-crystalline veins of secondary calcite are observed.

230-240 ft.

a/a

240-250 ft.

Similar to above, though the degree of clay alteration in the rock is decreasing. Relict hematite alteration has been preserved in many fragments which have subsequently undergone silicification. Secondary alteration of mafic minerals to pyrite is common. No secondary calcite is observed.

250-260 ft.

a/a

260-270 ft.

a/a with rare traces of white acicular zeolite (natrolite series ?). A marked reduction in secondary silicification is observed in this sample.

270-280 ft.

a/a with a continued decrease in the amount of silicification and secondary pyrite. No acicular zeolite observed.

280-290 ft.

40% Gray to very dark gray, locally red-gray dacite.

60% Very light gray, locally red-gray, strongly altered dacite. Mafic minerals are occasionally altered to magnetite, though more commonly to hematite. Alteration of plagioclase to clay ranges from moderate to extreme, occasionally with only casts of plagioclase crystals surviving. The groundmass is altered to white clay, clear tabular zeolite and rare traces of secondary sub-mm pyrite.

290-300 ft.

a/a with a vary few soft light green-gray fragments. The texture and degree of alteration is characteristic of a strongly sheared or faulted rock.

300-310 ft.

Similar to above with a general decrease in the degree of alteration. The mafic minerals continue to be strongly altered to hematite. Occasinal fracture surfaces contain a light coating of green clay and sub-mm pyrite crystals.

310-320 ft.

a/a with a slight increase in the white clay-zeolite alteration. A few light green-gray fragments have a texture suggesting protomylonite.

320-330 ft.

5% Very dark gray fresh glassy dacite.

85% Gray to light green-gray, locally red-gray, strongly altered dacite.

10% Green-gray cataclastized dacite with many fragments having a mylonite to protomylonite texture.

Vein filling quartz and botryoidal cryptocrystalline silica are present in some of the dacite fragments. A few of the dacite fragments have been indurated with silica, often associated with secondary precipipated sub-mm pyrite crystals. Secondary zeolite alteration is associated with the more strongly altered and brecciated dacite fragments.

This sample consists of fresh glassy subvolcanic dacite, cataclastized rock associated with subvolcanic emplacement, contact metamorphosed rock and hydrothermally altered rock.

330-340 ft.

a/a

340-350 ft.

a/a with only rare traces of fresh glass.

350-360 ft.

30% Light green to green-gray brecciated and sheared dacite. The brecciated fragments contain cryptocrystalline silica and minor pyrite.

70% Gray to light gray altered dacite with variable amounts of secondary hematite.

Tr. dark gray fresh glassy dacite.

360-370 ft.

a/a

370-380 ft.

a/a with a decrease in brecciated fragments to 10%.

380-390 ft.

a/a

390-400 ft.

80% Gray to red-gray variably altered glassy dacite with secondary green-gray clay and pyrite along fracture surfaces.

390-400 ft. (cont.)

20% Light gray to green-gray, strongly sheared, brecciated and clay altered dacite with secondary sub-mm pyrite crystals.

Tr. orange oxidized mylonite fragments.

400-410 ft.

a/a with a marked increase in secondary clear tabular zeolite occurring along fracture surfaces.

410-420 ft.

a/a with 5% orange oxidized mylonite.

420-430 ft.

a/a

430-440 ft.

a/a with 20% orange oxidized mylonite. Note, all Fe appears to occur as hydrous Fe oxides in orange fragments.

440-450 ft.

90% Gray fresh to slighty altered dacite. Very localized reddish zones in the groundmass are the result of hematite alteration. Rare traces of secondary pyrite occur along fracture surfaces has formed subsquent to the hematite alteration.

5% Light green to light green-gray mylonite with secondary sub-mm pyrite and minor clear tabular zeolites.

5% Orange hydrous Fe oxide bearing mylonite. Hydrous oxidation of Fe appears to be the most recent alteration event.

450-460 ft.

a/a

460-470 ft.

a/a with an increase in the amount of clear tabular zeolite along fracture surfaces; continued tr. of orange mylonite.

470-480 ft.

10% Orange mylonite, the result of Fe oxidation in the light green-gray mylonite.

10% Light green-gray mylonite a/a.

80% Gray to dark gray variably altered dacite a/a.

480-490 ft.

a/a with only a trace of the orange oxidized mylonite.

490-500 ft.

a/a with occasional calcite crystals occurring with clear tabular zeolite crystals in fractures.

500-510 ft.

100% Gray to light red-gray hematite altered dacite with up to 5% of rock fragments showing the effect of shearing. Minor sub-mm crystals of pyrite occur along fracture surfaces and disseminated in the dacite, in part forming at the expense of hematite. Minor vein filling quartz and calcite are observed.

510-520 ft.

85% Gray to light gray clay and zeolite altered dacite with variable hematite alteration. Occasional sub-mm fractures are observed to be filled with calcite and zeolite.
15% Light green-gray, rarely orange, protomylonite and brecciated dacite. Secondary fine grained pyrite is observed to be present in unoxidized cataclastic fragments.

520-530 ft.

a/a

530-540 ft.

60% Dacite a/a.
30% Light gray to light green-gray protomylonite and fine breccia
10% Orange oxidized protomylonite.

540-550 ft.

a/a with 10% very dark gray fresh glassy dacite and 1% orange oxidized protomylonite.

550-560 ft.

60% Gray to light gray clay and zeolite altered dacite with variable amounts of hematite alteration. Occasional fractures are observed to be filled with calcite and zeolite.
30% Light green-gray pyrite-bearing protomylonite and brecciated dacite with zeolite and calcite veining.
10% Orange oxidize protomylonite.

560-570 ft.

Note: Many fragments are in excess of 2 cm; this sample may contain slough from up hole.
95% Dark gray to gray altered dacite with local secondary hematite. White secondary clay and pyrite occur along occasional fracture surfaces.
5% Light green-gray, locally orange, protomylonite and brecciated dacite a/a.

End of Rotary Drilled Section.

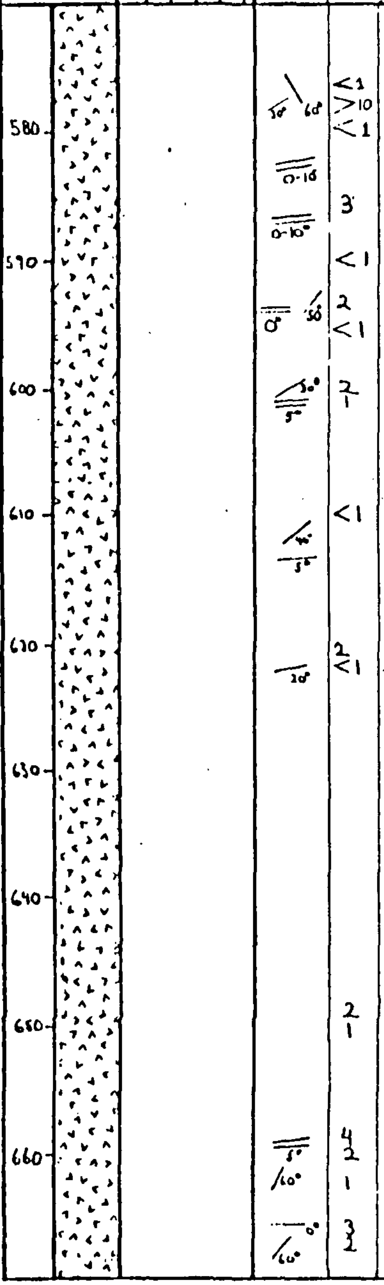
DEPTH FT		LITHOLOGIC DESCRIPTION	COMMENTS
575	664	Rhyodacite: Gray, locally purple-gray, rhyodacite with a macro-texture resembling a very dense welded autobreccia. The rock shows no flow banding, fractures, or vesiculation features that would suggest surface flow dynamics. Occasional irregularly shaped cm-sized vugs are present, lined with a clear tabular zeolite (sub-mm sized crystals, possibly chabazite). Occasional larger irregular cavities and associated fractures are partially to completely filled with calcite and quartz (i.e. at 675 ft.). Calcite also fills irregularly shaped vugs associated with a few of the autobreccia-like fragments. Rarely sub-cm size irregular vugs are observed to be filled with cryptocrystalline silicia. Note that in some vugs a clear plyable material (silicon-like cement ??) has been added; clearly a drilling artifact. The degree and type of rock alteration is somewhat variable. The Fe-bearing minerals are moderately to completely altered to hematite. The groundmass is generally altered to a light green-gray clay, probably smectite. Local hematite alteration has also taken place in the groundmass.	577-579 ft. Fractured and broken rock. 585-586 ft. a/a 586-760 ft. Autobreccia-like texture with generally subrounded to subangular fragments 1-15 cm in size. Matrix and fragments are made up of the same compostion. Fractures occasionally follow fragment boundaries, though more often they cut across such boundaries.
		629 ft. The fractures are largely filled with calcite. Fracture surfaces show the same patterns of secondary minerals as observed in the overall rock alteration (mafic minerals altered to reddish hematite, groundmass altered to green-gray clay and trace calcite, clear feldspar (sandine ?) appears to be fresh).	627-628 ft. Predominantly sealed fractures with occasional open cavities.
		666 ft. Green-gray sheared and brecciated zone approximately 8 inches thick. Platy fracture surfaces show dark green slickensides and precipitated calcite. The host rock has a strongly welded crystal-lithic silicic tuff microtexture that grades into a more typical rhyodacite subvolcanic texture within 5 ft. above and below the noted depth.	658 ft. Partially sealed fractures with open cavities.

RECOVERY %

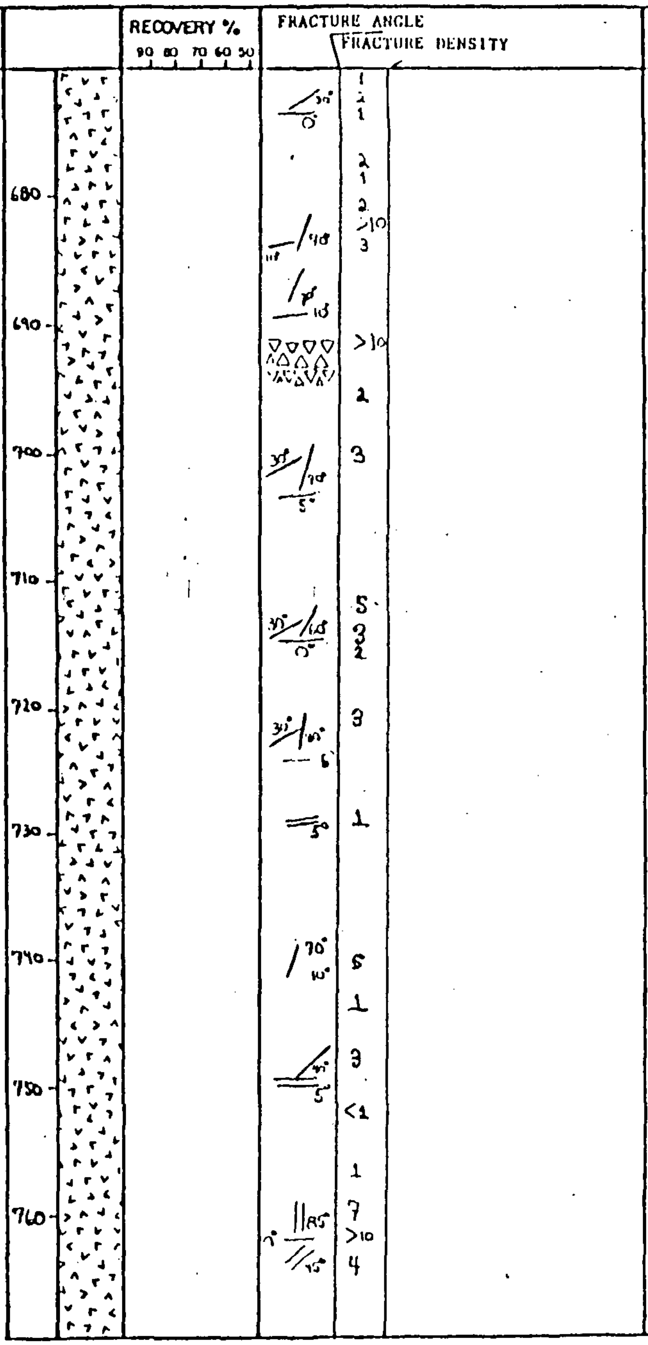
90 80 70 60 50

FRACTURE ANGLE

FRACTURE DENSITY



DEPTH FT		LITHOLOGIC DESCRIPTION
		691-693 ft. Brecciated rhyodacite with calcite partially filling fractures. Both the pervasive rock alteration and brecciated surfaces show fresh clear feldspar (sandine ?) and mottled red hematite alteration in a greenish groundmass. The groundmass is generally harder than the metal probe point and shows no clear texture with the hand lens. Local small cavities of calcite are present in varying density throughout this section of rock.
		756-764 ft. Fractured purple-gray to green-gray rhyodacite. The rock contains variable amounts of red hematite alteration mottled with the a green-gray groundmass. Small irregular vesicles are filled with calcite and silica. The clear feldspar crystals appear to be fresh. Near fracture surfaces the groundmass and feldspar show clay alteration.
764	850	Rhyodacite to Dacite: Gray to purple gray, massive. The groundmass conatains variable hematite alteration. Sub-mm feldspars and hornblende crystals are recongnizable.



COMMENTS

675 ft. Calcite lines vesicles and fractures.

682-684 ft. Broken and fractured rock.

692-694 ft. Brecciated with poor fracture cementing.

756-764 ft. The texture suggests silica metasomatization. The fractures are filled with calcite and pyrite. Occasional fracture surfaces have a red-orange staining, associated with partial oxidation of secondary pyrite. Secondary pyrite is present locally in the rock, usually away from fractures.

758-770 ft. Moderately to strongly-fractured, including some vertical fracturing.

DEPTH FT

LITHOLOGIC DESCRIPTION

RECOVERY %
90 80 70 60 50

FRACTURE ANGLE
FRACTURE DENSITY

COMMENTS

850 1036

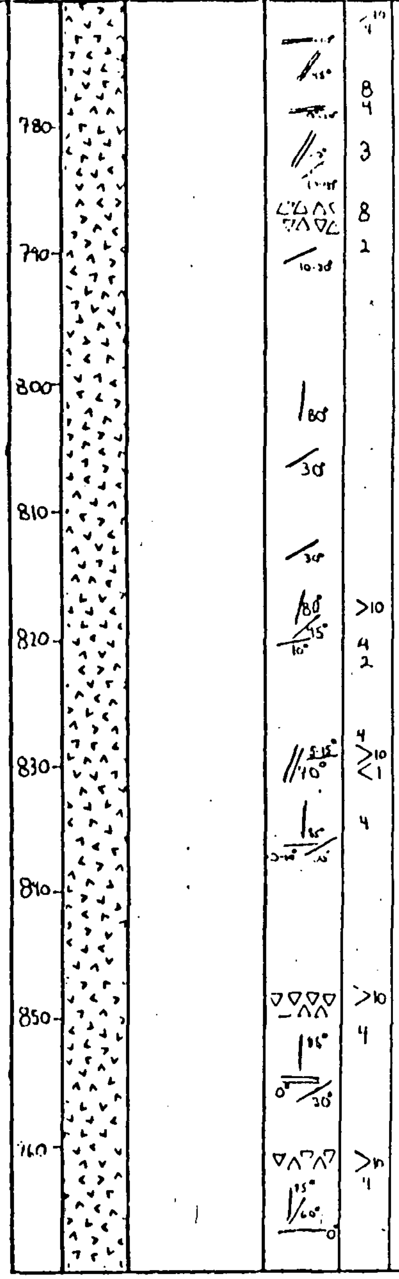
775-780 ft. Broken or crushed zone poorly cemented with a soft white clay, contains many open cavities.

817-821 ft. Strongly fractured and sheared rock.

827-828 ft. Strongly fractured and sheared rock.

848-850 ft. Cataclastized zone which is poorly cemented. The fracture surfaces are coated with a white clay-like mineral while the center of the fractures are partially filled with coarse calcite crystals.

Rhyodacite-Dacite: gray, locally purple gray, massive. The texture varies from a welded autobreccia to a welded crystal-lithic tuff. No flow features or vesiculation are observed. The autobreccia fragments are sub-angular to rounded and range from 1-20 cm.
862-875 ft. Fractures, horizontal to high angle, with no slickensides. No secondary precipitation or alteration minerals are observed.



770-784 ft. Fractures lined with thin film of calcite and trace pyrite.

792-843 ft. Fractures filled with calcite and varying amounts of pyrite. Pyrite precipitation both preceded and is cogenetic with calcite. Reddish stained fractures both cross-cut and are cross-cut by some calcite veinlets.

843.5-844 ft. Single vein of quartz with sub-mm calcite lining.
848-850 ft. Brecciated and poorly cemented.
850-903 ft. Calcite seams and veins up to 3 mm wide. The groundmass of the rock-both adjacent to and away from fractures, has been pervasively altered to a gray-green clay with local small areas of orange hematite and secondary calcite.

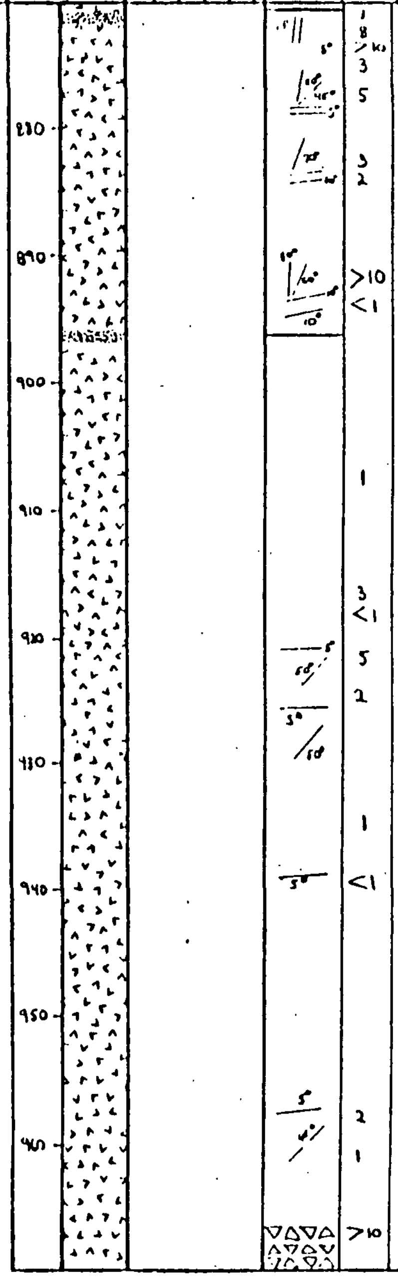
DEPTH FT	LITHOLOGIC DESCRIPTION		RECOVERY % 90 80 70 60 50	FRACTURE ANGLE / FRACTURE DENSITY	COMMENTS

875-882 ft. Predominately vertical fractures coated with thin dark green sheared clay. The fractures cross-cut calcite veins.

890-892.5 ft. Fractured and brecciated zone containing minor white clay, calcite, and clear tabular zeolite (chabazite ?). These fractures cross-cut earlier formed veins of calcite and pyrite. The rock surrounding this brecciated zone is strongly altered to clay.

900-967 ft. Calcite bearing fractures. A few fracture surfaces contain a very thin zone of slickenside-like sheared rock. Occasional calcite bearing fractures show a dark green clay alteration adjacent to the rock.

967-971 ft. Brecciated zone with a pervasive light green-gray clay alteration of the rock. Minor white clay and traces of a clear tabular zeolite (chabazite ?) have formed on some of the fracture surfaces.



** 871 ft. The core contains an 8 inch thick section of soft dark gray clay-like material with sharp upper and lower boundaries. This appears to be an artifact of drilling. When viewed through a microscope it appears to be made up of finely ground rock containing fine fresh feldspar fragments.

897 ft. Probable drilling artifact, see comment at 871 ft.

910-1002 ft. General increase in pervasive alteration of dacite to light green-gray clay and dark green clay, chlorite, and calcite.

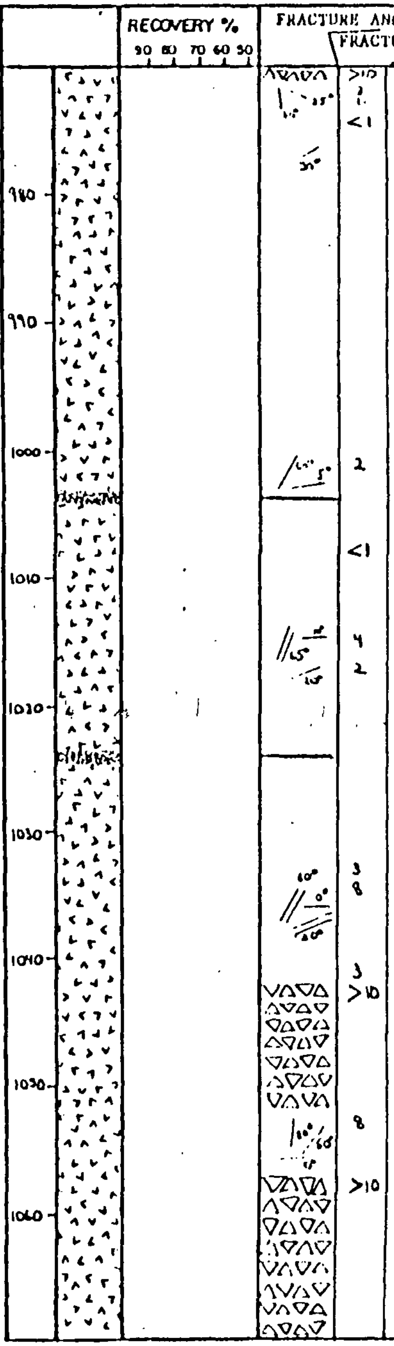
DEPTH FT | LITHOLOGIC DESCRIPTION | RECOVERY % | FRACTURE ANGLE / FRACTURE DENSITY | COMMENTS

LITHOLOGIC DESCRIPTION

971-983 ft. Generally unfractured rock with only occasional vesicles filled with calcite.

1003-1039 ft. Dacite autobreccia showing variable secondary hematite alteration in the groundmass. Often the variations in the intensity of secondary hematite accent the autobreccia-like fragments.

1035-1086 ft. The rock is strongly brecciated and variably, but generally strongly, altered to clay. Many of the breccia fragment surfaces have a sheared slickenside texture. No obvious secondary precipitation minerals are observed in this zone.



COMMENTS

984 ft. Fractures and vesicles are filled with calcite.
986 ft. a/a
989 ft. a/a

995-1039 ft. Vein and vesicle filling calcite is common.

1004 ft. Probable drilling artifact, see comment at 871 ft.

1024 ft. Probable drilling artifact, see comment at 871 ft.

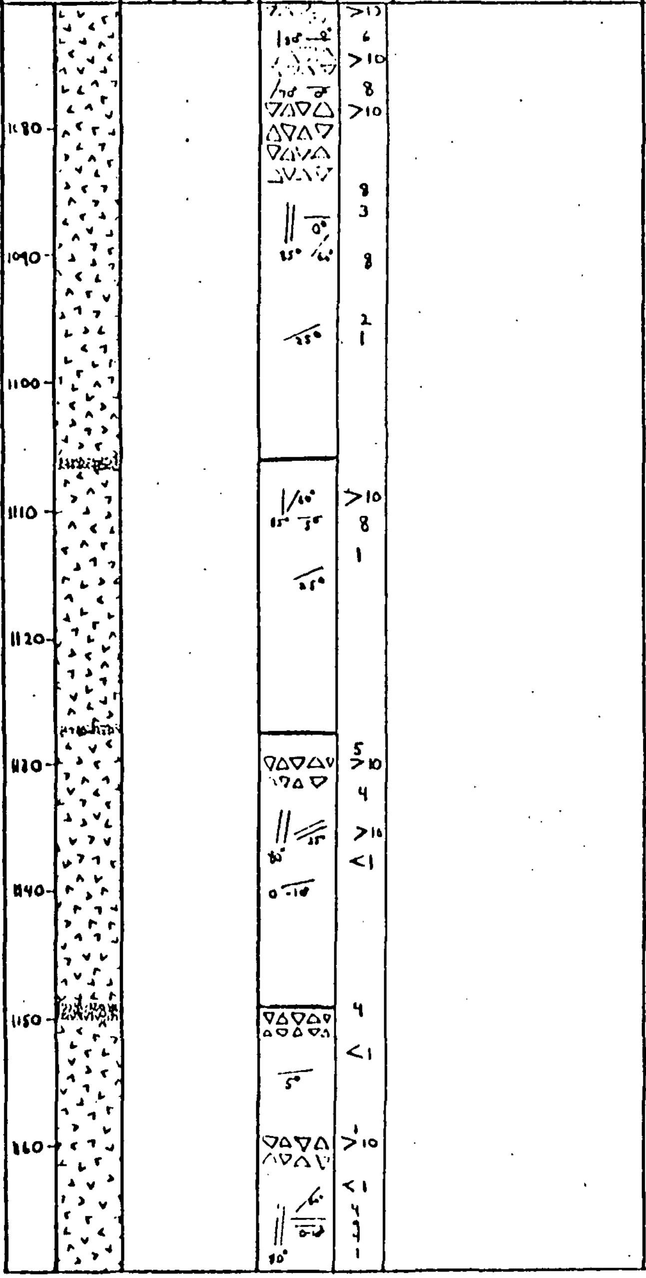
1039-1042 ft. Secondary pyrite is associated both with dark green slickensides and with traces of calcite and clay.
1042-1059 ft. Rare traces of pyrite are present.

1059-1062 ft. An older fracture event has resulted in a fracture and breccia zone with veins of a soft clear mineral with boxwork morphology. Replacement pyrite is present in the the brecciated fragments.

DEPTH FT		LITHOLOGIC DESCRIPTION
1086	1125	Dacite: Gray to purple-gray dacite with pronounced autobreccia-like features. The secondary hematite alteration accounting for the purple color is most pronouced in the matrix of the autobreccia. The stable Fe mineral in much of the rock is secondary clay/chlorite. Minor veins and vesicles of secondary quartz and white clay are usually under 5 mm thick. Near vertical fractures with pronounced sheared faces postdate the mineral filled fractures and vesicles.
1125	1190	Dacite: Gradual decrease in the autobreccia-like features. 1131-1135 ft. Coarsely brecciated dacite with minor mm-thick veins of calcite. The brecciation appeare to postdate the calcite seams. 1141-1151 ft. Brecciated dacite with abundant vertical fractures. No pronounced secondary alteration is observed. No precipitation minerals appear to be associated with the brecciation. Minor calcite veins appear to predate the brecciation. 1159.5-1162 ft. A/a, with some of the fractures following earlier calcite veins. 1164 ft. The dacite contains abundant microcrystalline vesicles. Background alteration appears to include green clay or chlorite, preferentially located around vesicles. Secondary hematite occurs in the groundmass away from the vesicles. The only recognizable primary minerals are mm to sub-mm sized plagioclase laths.

RECOVERY %
90 80 70 60 50

FRACTURE ANGLE
FRACTURE DENSITY



COMMENTS

1074-1079 ft. Minor to trace of pyrite occurs. Note that the pyrite occurrence may predate the intense brecciation of this zone.

1106 ft. Probable drilling artifact, see comment at 871 ft.

1128 ft. Probable drilling artifact, see comment at 871 ft.

1149 ft. Probable drilling artifact, see comment at 871 ft.

1164 ft. Local sub-mm zones of hematite which may be possible pseudomorphs of mafic minerals. Secondary calcite is common, occurring both in vesicles and plagioclase sites. Green clay alteration appears to be subsequent to hematite alteration.

DEPTH FT

LITHOLOGIC DESCRIPTION

1169-1178 ft. Only minor vesicle and fracture filling minerals are present, mainly calcite. Background rock alteration suggests a partial oxidation of iron minerals followed by secondary green clay or chlorite. The rock contains abundant microvesicles in a crystal-rich groundmass. Minor secondary calcite is ubiquitous throughout the rock.

Dacite: Gray to light gray, pervasive though variable clay altered dacite. A few sub-mm clear feldspar crystals appear to be fresh. Many feldspar phenocrysts appear to be altered to clay and calcite. The groundmass contains variable zones of secondary dark green clay/chlorite and minor zones of secondary purple hematite.

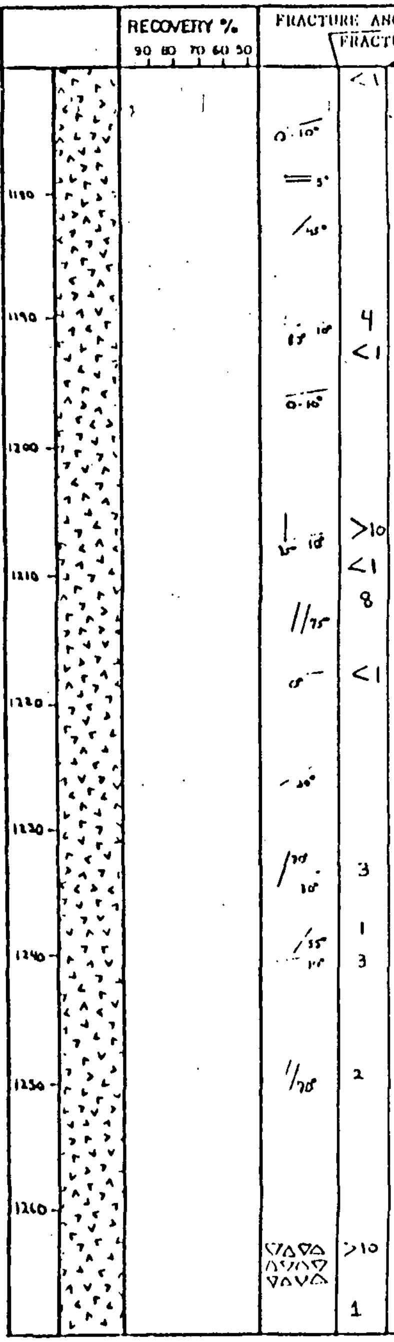
1200 ft. The rock is becoming increasingly altered to clay, causing the rock to become softer.

1208 ft. The rock is more brittle due to a decrease in clay alteration. Many of the fracture surfaces show slickenside effects suggesting vertical to oblique high angle movement. Vein filling minerals include calcite and unidentified soft white mineral which does not effervesce in HCl. Traces of mordenite needles may be present as a vein filling mineral.

1211-1217 ft. Highly fractured rock with veins a/a. The background alteration of early stage hematite followed by subsequent green clay or chlorite continues.

1229-1232 ft. Fractures and vesicles show linings of green clay or chlorite *followed by massive calcite. At a hand lens scale no* phenocrysts are readily identifiable in the rock. The rock appears to have undergone a mild but pervasive hematite alteration followed by a clay or chlorite alteration. The latter is preferentially located near vesicles and plagioclase sites. Minor secondary calcite commonly occurs in feldspar sites.

1263-1266 ft. A brecciated zone. The rock shows a pervasive background clay alteration. A clear zeolite with a tabular morphology (chabazite ?) and pervasive purple to orange hematite alteration of the rock is present. Very minor secondary calcite is present along fracture surfaces.



COMMENTS

1174 ft. Occasional vesicles show green clay or chlorite alteration along the edges, followed by calcite, and rarely with quartz following calcite. More commonly vesicles and fractures are filled with calcite, and occasionally with calcite and mordenite. A few of the the vesicles contain only an acicular zeolite (mordenite ?). One vesicle contains massive calcite, followed by mordenite, which in turn is followed by bladed calcite. Pervasive rock alteration includes green clay or chlorite and secondary calcite. Plagioclase laths have altered to clay, possible zeolite, and calcite.

1187 ft. Rock alteration shows an early episode of hematite alteration of Fe minerals, both phenocrysts and groundmass, to hematite, *followed by a later* stage green clay or chlorite, preferentially occurring near vesicles and fractures. Larger vesicles and fractures contain secondary calcite and mordenite.

1217-1218 ft. Only minor amounts of calcite in fractures and vesicles.

1232-1254 ft. The intensity of fracture and vesicle filling is variable.

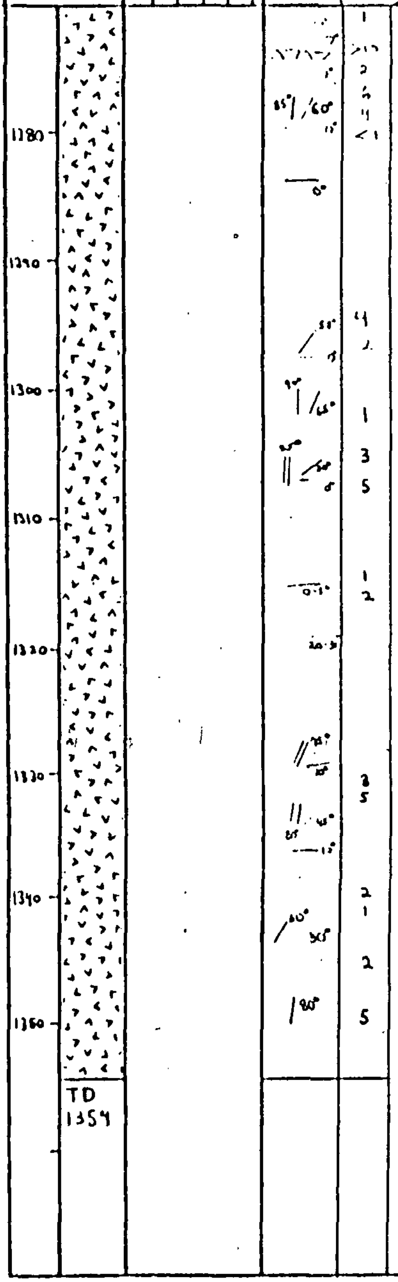
1259 ft. Late stage calcite is present in a few of the vesicles. Mordenite also occurs with the *calcite. The latest stage of* calcite, formed subsequent to the mordenite, has a bladed morphology.

DEPTH FT | LITHOLOGIC DESCRIPTION | RECOVERY % 90 80 70 60 50 | FRACTURE ANGLE | FRACTURE DENSITY | COMMENTS

1267-1276 ft. Dacite with secondary hematite occurring in the groundmass, followed by subsequent secondary green clay or chlorite. Vesicle-filling minerals include green clay followed by massive calcite.

1294 ft. A strongly fractured zone. The fractures are partially filled with chlorite (or green clay), minor calcite, mordenite, and sub-mm Fe sulfide (pyrite ?). Soft white areas probably include other unidentified secondary minerals. Mordenite appears to make up the bulk of secondary mineralization in these fractures.
1296 ft. Occasional fractures containing minor secondary quartz, followed by calcite and mordenite. The rock shows somewhat less alteration than up-hole, with only minor early stage hematite alteration. Small sub-mm fractures are predominately filled with silica. Minor localized secondary calcite is limited to the groundmass.
By 1298 ft. The secondary mineralization associated with fractures appears to be limited to calcite and a zeolite. Sealed fractures are filled with calcite. Open fracture surfaces have a fine coating of a crystalline zeolite (mordenite ?). Rare sub-mm silica veins may be the result of nothing more than localized metasomatic alteration.

1301-TD (1354 ft.) The dominant fracture filling minerals are calcite and mordenite with the most recent morphology consisting of calcite blades forming on mordenite needles. The most intensely fractured zones occur at 1331 ft., 1334-1340 ft., and 1347-TD ft. Many of these fractures show a lining of green clay or chlorite. Much of the more recent alteration is dominated by light green clay or chlorite which tends to obscure earlier hematite alteration. The earlier hematite alteration is best preserved in those areas away from intense fracturing. Microscopic sized Fe sulfide occurs as a trace vein mineral and as an alteration mineral below 1319 ft. It occurs most commonly in the intensely fractured areas.



1276-1277 ft. Fractures show both massive calcite and quartz filling.
1278-1280 ft. The fracture surfaces show very minor calcite mainly in open fractures. No secondary quartz is observed.
1280-1294 ft. Generally unfractured rock with minor calcite filled vesicles.

A clear to white zeolite with a tablet-like morphology occurs in fractures, associated with a rare trace of pyrite (?), 1319 ft. (see 1322 ft. away from main fracture veining). The degree of secondary green clay-chlorite increases below 1315 ft., especially in areas of fracturing. In addition to an increase of clay-chlorite, a rare trace of drusy quartz occurs, cogenetic with mordenite. Minor secondary pyrite also occurs as a vein-filling mineral. The precipitation of quartz appears to represent the most recent, perhaps ongoing, activity.

1350 ft. Thick calcite-mordenite veins observed.

1351 ft. A very fine clear white vein filling zeolite, possibly mordenite with a more tabular morphology is observed.
1352 ft. Veining of calcite-mordenite-quartz-pyrite.