

BREITENBUSH GEOTHERMAL PROSPECT

LITHOLOGY

For Drill Hole

U.S.A. 58-28

Sunoco Energy Development Co.

Breitenbush

Marion Co., Oregon

Waibel

Geol. Services

Breitenbush

U.S.A. 58-28

Depth In Feet

0-87	70%	Dk gray aphanitic basalt w/ tr. serpentinized shearing planes.
	30%	Gray to light gray devitrified cxl & lithic bearing tuff, cxl & lithic fragments 25% of volume; mixed lithic fragments up to 2 mm, quite altered, cxls incl. sub-rounded to subangular qtz, altered feldspar; tuff contains minor to tr. secondary epidote and hematite.
87-90		Dark gray aphanitic basalt w/ tr. serpentinized shear planes.
90-100		Dark gray aphanitic basalt a/a w/ tr. olivine microphenocrysts altering to hematite, iddingsite; groundmass plagioclase laths appear to be aligned subparallel. Trace of very fine grained pyrite associated w/ serpentinized shearing.
100-110	a/a	
110-120	a/a	
120-130	a/a	
130-140	a/a	W/ tr. gray to lt. gray zones of alteration, plagioclase & groundmass glass to clay.
140-150	a/a	
150-160	a/a	W/ slight increase in serpentinization & pyrite.
160-170	a/a	W/ disseminated hematite becoming more common.
170-180	a/a	
180-190		Dark gray aphanitic basalt a/a.
190-200	a/a	W/ up to 2% very light gray clay altered fragments.
200-210	a/a	
210-220	a/a	
220-230	a/a	
230-240	a/a	
240-250	a/a	

250-260	a/a	W/ up to 3% of cutting fragments containing finely disseminated Fe sulfide (pyrite).
260-270	a/a	
270-280	a/a	
280-290	a/a	
290-300		Very dark gray aphanitic basalt w/ tr micro-phenocrysts of plagioclase and olivine. Secondary pyrite is common. Less than 5% very light gray clay altered, sheared, basalt fragments, tr. dk green gray to black clay/chlor. (?) pods.
300-310	a/a	
310-320	90%	Very dark gray aphanitic basalt a/a.
	5%	Gray basalt w/ micro-amygdules of dk green clay/chlor and occasional tuff fragments.
	5%	Dk gray to dk brown gray, basaltic tuff & tuffaceous sediments; often brecciated; secondary v. fine grained sulfide (pyrite?) common.
320-330	80%	Gray to lt. gray holocxl basalt, predominantly made up of plag.; w/ abundant tuffaceous fragments up to 3mm across, locally going to a brecciated tuff w/ minor basalt.
	20%	Dk gray basalt a/a.
330-340	100%	Dk gray to gray, locally brown gray lithic tuffaceous sediment; occasionally showing minor fissility. Lithic clasts predominantly sub-mm variable textured basaltic fragments. Minor to tr. secondary sulfide (pyrite?) is present.
340-350		Gray to light gray, locally orange basaltic tuffaceous sediments w/ minor silt and claystone fragments. Often the finer grained fragments have been silicified. Minor aphanitic basalt fragments present.
350-360	a/a	W/ wide range of textures, colors and compositions.
360-370	a/a	
370-380	80%	Dk gray aphanitic plag. porphyritic basalt, subhedral cxls of clear plag. usually less than 1 mm. Basalt contains minor dk green clay (chlor?) and minor very light green fresh anhedral olivine phenocrysts up to 1 mm.
	20%	Dk gray cxl lithic basaltic tuffaceous sediments, locally incorporated in fragments of basalt. Basalt appears to be a thin sill.

380-390	100%	Gray to dk gray to brown gray basaltic cxl lithic tuffaceous sediments w/ minor gray silt and claystone, locally w/ abundant secondary pyrite. Cxl and lithic fragments usually less than 3 mm.
390-400		Mixed gray sedimentary tuffs, cxl tuffs and cxl lithic tuffaceous sediments; common angular clear plagioclase fragments; minor fresh angular olivine fragments. Minor fragments are orange (hematite alteration). The secondary pyrite occurs in local concentrations Occasional minor tr. carbonaceous zones.
400-410	a/a	
410-420	a/a	
420-430	a/a	
430-440	a/a	
440-450	a/a	
450-460	a/a	W/ tr. carbonaceous zones.
460-470	a/a	
470-480	a/a	
480-490	a/a	
490-500	75%	Gray to dk gray aphanitic basalt.
	20%	Mixed tuffaceous sediments a/a.
	5%	Very light gray tuffaceous sediments.
500-510	a/a	Brown gray to dk brown gray lithic basaltic tuffaceous sediments; subrounded lithic fragments usually sand-size or smaller; tr. secondary pyrite; tr. carbonaceous zones.
510-520	a/a	W/ occasional fresh angular cxl fragments of clear plagioclase and olivine.
520-530	a/a	
530-540	a/a	
540-550		Gray to brown gray fine grained cxl bearing lithic sedimentary basaltic tuffs w/ fine cxln disseminated secondary pyrite. Lithic and cxl fragments are mostly less than 1 mm. Occasional fresh angular cxl fragments of clear plagioclase and olivine.

550-560	80%	Sedimentary tuffs a/a.
	20%	Gray to dark gray aphanitic, occasionally micro-vesicular basalt w/ minor plag. and olivine phenocrysts.
560-570		Gray to brown gray cxl lithic basaltic sedimentary tuffs a/a. W/ lithic fragments increasing in size up to 4 mm; continued secondary pyrite; tr. carbonaceous fragments.
570-580	a/a	
580-590	a/a	W/ only tr. secondary pyrite.
590-600	a/a	
600-610	a/a	W/ greater variations, ranging from cryptocxl to cxl lithic sands. Color varies from very light gray to very dark gray brown. Note: pipe dope on sample makes pyrite appear to be much more common than it actually is.
610-620	a/a	Some of the very fine grained fragments appear to be silicified.
620-630	a/a	1 cxl fragment of unidentified clear zeolite.
630-640	a/a	
640-650	a/a	
650-660	a/a	
660-670	90%	Gray to light gray cxl lithic tuffaceous sediments; abundant sand size mixed lithics; angular sand size clear feldspar; sand size and smaller needles of dark green black hornblende cxls.
	10%	Mixed tuff and aphanitic basalt fragments.
670-680	40%	Cxl lithic tuff a/a.
	40%	Light brown to brown gray tuff partially devitrified to clay.
	20%	Mixed tuffs and lithic fragments.
680-690	50%	Dk gray aphanitic pyr. plag. basalt w/ occasional clear pyr. plag. phenocrysts up to 2 mm long; tr. localized secondary pyrite.
	50%	Mixed tuff and lithic fragments.
690-700	80%	Aphanitic basalt a/a w/ localized reddish hematite and common secondary pyrite.
	20%	Mixed tuff fragments.
700-710	a/a	

710-720	a/a	W/ minor unidentified zeolites in veins.
720-730	95%	Gray to brown slightly carbonaceous, clay rich tuffaceous sediments; clay appears to act like montmorillonite.
	5%	Aphanatic basalt fragments.
730-740	a/a	
740-750	100%	Extremely clay rich tuffaceous sediments a/a.
750-760	a/a	
760-770	a/a	
770-780	a/a	
780-790	a/a	
790-800	a/a	
800-810	80%	Gray to dark gray slightly welded tuff w/ localized concentrations of sub-sand size fragments of plagioclase, glass and possible olivine.
	20%	Brown to gray montmorillonite altered tuff a/a.
810-820	100%	Gray to dk gray welded tuff a/a.
820-830	75%	Brown to brown gray montmorillonite altered tuff.
	20%	Gray to dk gray welded tuff.
	5%	Cxl lithic tuff.
830-840	a/a	
840-850	90%	Brown to brown gray montmorillonite altered tuff.
	10%	Mixed tuffs and lithic fragments.
850-860	a/a	
860-870	100%	Light gray to gray to brown montmorillonite altered tuffs; locally carbonaceous; tr pyrite usually associated w/ carbonaceous zones.
870-880	a/a	Locally basaltic tuffs are cxl lithic bearing; tr. pyrite.
880-890	a/a	
890-900	a/a	Increase in v. fine cxl lithic components.
900-910	a/a	V. fine cxl lithic tuffs dominant.
910-920	a/a	W/ tr. pyrite.

920-930	a/a	
930-940	a/a	
940-950	60%	Brown to gray strongly montmorillonite altered tuff w/ occasional cxl and lithic components; tr. carbon.
	40%	Gray to brown gray v. fine grained cxl lithic basaltic tuff w/ matrix slightly to moderately altered to montmorillonite.
950-960	a/a	
960-970	a/a	
970-980		Light gray to brown gray to brown fine grained basaltic tuff w/ occasional cxl & lithic components; tuff strongly montmorillonite altered.
980-990	a/a	W/ about 20% of sample dissolving into drilling fluid.
990-1000	a/a	W/ about 20% of sample dissolving into drilling fluid.
1000-1010	a/a	
1010-1020	a/a	
1020-1030	a/a	
1030-1040	a/a	Slightly carbonaceous.
1040-1050	a/a	W/ approximately 20% of sample lost during washing.
1050-1060	60%	Gray to brown gray moderately sorted fine grained cxl lithic rich tuff; locally carbonaceous; only minor clay alteration.
	40%	Brown to brown gray, very fine grained, montmorillonite altered tuffaceous sediments.
1060-1070	80%	Dk gray aphanitic oliv. plag. porphyritic basalt w/ occasional vesicles lined w/ dk green clay; dk gray groundmass slightly altered to clay; tr. secondary calcite and zeolites.
	20%	Mixed tuff fragments.
1070-1080	a/a	
1080-1090	95%	Dk gray aphanitic basalt a/a.
	5%	Mixed tuff fragments.
1090-1100	a/a	
1100-1110	a/a	

1110-1120	a/a	
1120-1130	85%	Dk gray aphanitic basalt a/a w/ concentration of green clay common; minor secondary calcite and zeolites.
	15%	Mixed tuffaceous fragments.
1130-1140	50%	Dk gray aphanitic basalt a/a.
	30%	Gray to brown gray to green gray cxl lithic rich sandy tuffaceous sediments.
	20%	Gray to brown v. fine grained clay altered tuffaceous sediments.
1140-1150	80%	Gray to brown gray locally carbonaceous sand size cxl lithic rich tuffaceous sediments.
	20%	Brown to gray v. fine grained clay altered tuffaceous sediments.
1150-1160	a/a	Becoming slightly finer; increased montmorillonite alteration.
1160-1170	50%	Brown to brown gray fine grained cxl lithic tuff. sed. w/ moderate montmorillonite alteration; tr. carbonaceous zones.
	50%	Brown to brown gray very fine tuffaceous sediment w/ abundant montmorillonite alteration.
1170-1180	a/a	W/ tr. celadonite alteration.
1180-1190	90%	Green gray to gray, rarely orange, qtz bearing eutaxitic cxl lithic intermediate to silicic cemented tuffs.
	10%	Brown to brown gray fine grained tuffaceous sediments.
1190-1200	100%	Dark green to green gray to gray quartz and hornblende bearing eutaxitic cxl lithic cemented tuffs. Angular to subrounded lithic clasts of mixed composition occur up to 5 mm in cuttings.
1200-1210	a/a	W/ tr. slough from uphole.
1210-1220	a/a	
1220-1230	a/a	W/ some cuttings indicating minor welding.
1230-1240	100%	Green gray quartz bearing eutaxitic cxl lithic welded tuff. Green color appears to be the result of both secondary celadonite and chlorite.
1240-1250	a/a	W/ tr slough from up hole.
1250-1260	a/a	

1450-1460	70%	Brown to red brown to gray brown cxl and lithic bearing fine grain tuff, grading to lithic rich tuff.
	30%	Gray green to gray clay altered eutaxitic cemented tuff.
1460-1470	a/a	W/ increased clay including white clay.
1470-1480	a/a	
1480-1490	a/a	W/ increased Fe oxidation, increased eutaxitic texture, and tr. mylonite.
1490-1500	a/a	
1500-1510	a/a	Eutaxitic texture common.
1510-1520	70%	Dark green gray aphanitic micro-porphyritic andesite w/ mafics in groundmass and mafic phenocrysts (pyroxene?) gone to chlorite and hematite.
	30%	Mixed tuffaceous fragments.
1520-1530	a/a	W/ tr. sulfide (pyrite?) in andesite.
1530-1540	60%	Orange, locally to gray, eutaxitic clay altered tuff w/ abundant white clay vugs.
	40%	Dark green gray andesite a/a.
1540-1550	70%	Orange to gray, minor green gray tuff a/a.
	20%	Slough from up hole.
	10%	Dark green gray andesite.
1550-1560	70%	Light green gray cxl lithic tuff. Cxls predominantly subangular to subrounded clear feldspar usually less than 1 mm. Lithic fragments are all quite clay altered volcaniclastics.
	15%	Orange tuffs and lithic tuffs.
	15%	Slough from up hole.
1560-1570	85%	Light green gray cxl lithic tuffs a/a, green may indicate celadonite.
	15%	Mixed tuffaceous fragments.
1570-1580	95%	Light green gray cxl lithic tuff a/a w/ possible tr. devitrified pumice fragments.
	5%	Mixed volcaniclastic and tuff fragments.
1580-1590	a/a	
1590-1600	a/a	
1600-1610	a/a	

1610-1620	90%	Gray to dark gray to brown gray cxl (feldspar) bearing lithic tuff w/ rounded to subangular volcanic fragments up to 4 mm composing up to 60% of the tuff.
	10%	Green gray cxl lithic tuffs a/a.
1620-1630	a/a	
1630-1640	50%	Gray to dk gray to brown gray lithic tuff a/a.
	50%	Light gray green to gray cxl lithic tuff.
1640-1650	90%	Light gray green to green cxl lithic tuff; cxls, less than 1% of volume, are clear subangular feldspar fragments; lithics up to 40% of volume, are subrounded mixed volcanics. Tr. mylonite observed.
	10%	Mixed dk gray lithic tuff and volcanic fragments.
1650-1660	a/a	W/ celadonite alteration not evenly distributed.
1660-1670	a/a	
1670-1680	40%	Light green gray to light green cxl bearing lithic tuff.
	40%	Gray to brown cxl lithic cemented tuff, lithics up to 30% of volume, up to 3 mm, are angular to subrounded mixed volcanics.
	20%	Mixed volcanic lithic fragments.
1680-1690	a/a	
1690-1700	a/a	
1700-1710	100%	Green gray to gray, locally brown, clay altered tuff w/ common subangular feldspar fragments, usually clear w/ occasional black opaque inclusions. Clay altered angular to rounded lithic fragments, up to 3 mm and as much as 20% of volume, appear to be silicic to intermediate volcanoclastics. Angular small fragments of black opaque minerals, some magnetic, are common in the groundmass.
1710-1720	a/a	Becoming more gray.
1720-1730	a/a	Now dark gray to dark green gray.
1730-1740	a/a	W/ slough from up hole (trip sample).
1740-1750	a/a	W/ color change to red gray. Texture and composition unchanged.
1750-1760	a/a	Continued dominated by red gray color, possibly welded rather than cemented.
1760-1770	80%	Purple gray eutaxitic cxl welded tuff, possible welded

1760-1770 (cont.)	80%	zone of above more cemented tuff.
	20%	Green gray to red gray tuff a/a.
1770-1780	90%	Dark purple gray eutaxitic plag. welded tuff.
	10%	Mixed tuffaceous fragments.
1780-1790	a/a	
1790-1800	a/a	
1800-1810	a/a	
1810-1820	a/a	
1820-1830	a/a	W/ localized celadonite alteration.
1830-1840	a/a	
1840-1850	a/a	W/ greater variation in color.
1850-1860	60%	Welded tuff a/a.
	40%	Mixed cemented tuffs and tuffaceous sediments, dominated by brown gray lithic cemented tuff.
1860-1870	80%	Green gray to red gray cxl bearing lithic cemented tuff.
	20%	Mixed volcanoclastic and tuffaceous fragments.
1870-1880	100%	Gray green to gray, locally purple gray cxl bearing lithic cemented tuff. Minor cxl population consists of angular plag. fragments up to 1 mm. Angular, strongly altered volcanic lithic fragments are usually under 2 mm and make up from 1 to 30% of the tuff, may include minor clay altered collapsed pumice fragments.
1880-1890	a/a	W/ increased % of larger (to 5 mm) mixed volcanic lithics.
1890-1900	a/a	
1900-1910	a/a	
1910-1920	60%	Lithic tuff a/a.
	40%	Dk gray strongly clay altered aphanitic intermediate to basic lava, strongly vesicular w/ dk green clay filled amygdules.
1920-1930	60%	Dark gray clay altered aphanitic plag. porph. lava a/a.
	20%	Lithic tuff.
	20%	Very dark gray fine grained tuffaceous sediments.

1930-1940	60%	Dark gray to gray, vesicular, clay altered, plag. porph. lava a/a.
	40%	Mixed lithic tuffs, to fine grained tuffaceous sediments.
1940-1950	a/a	
1950-1960	a/a	
1960-1970	75%	Dark gray to gray, aphanitic, plag. porph. lava a/a
1970-1980	90%	Dark gray to gray, aphanitic, vesicular, clay altered plag. porph. lava.
	10%	Mixed tuffaceous fragments.
1980-1990	a/a	With less plag. phenocrysts.
1990-2000	75%	Dark gray to gray aphanitic lava with occasional plag. phenocrysts.
	25%	Mixed tuffaceous fragments.
2000-2010	50%	Green gray, locally eutaxitic lithic bearing tuff; locally it appears to be welded. Lithic fragments are quite altered and generally less than 1 mm.
	25%	Dark gray aphanitic lava.
	15%	Brecciated and micro-breccia associated w/ aphanitic lava.
	10%	Mylonite.
2010-2020	85%	Green gray, locally eutaxitic lithic bearing tuff; locally welded w/ tr. clear angular feldspar cxl fragments. The lithic fragments are usually altered, and have locally undergone plastic deformation.
	15%	Mixed tuff, lava and mylonite.
2020-2030	a/a	With increased size and % of lithics in tuff.
2030-2040	95%	Dark green gray cemented lithic tuff.
	5%	Mixed volcaniclastic fragments.
2040-2050		Viscosity sweep sample.
	90%	Green gray to dk gray to brown gray, cemented lithic tuff.
	10%	Mixed volcanic fragments, predominantly basaltic.
2050-2060	100%	Dk gray to dk green gray, strongly cemented, cxl bearing lithic tuff, locally eutaxitic and possibly welded. Cxls are angular subrounded clear feldspar, all less than 1 mm. Also present are minor black opaque angular cxls. Lithics are strongly altered volcanic fragments, apparently mafic to silicic, locally composing up to 80% of the rock.

2060-2070	a/a	W/ some slough from uphole.
2070-2080	a/a	
2080-2090	a/a	
2090-2100	a/a	W/ tr. mylonite.
2100-2110	a/a	W. increase in green gray collapsed devitrified pumice and tr. secondary epidote.
2110-2120	100%	Green gray tuff a/a, becoming more welded. The lithic component is predominantly silicic w/ collapsed pumice fragments rather common. Cxl fragments make up to 5% of volume and include clear feldspar and quartz. Some quartz fragments have an embayed texture.
2120-2130	a/a	W/ lithics approx. 50% silicic, 50% intermediate/mafic.
2130-2140	a/a	Welded tuff.
2140-2150	a/a	
2150-2160	a/a	
2160-2170		Welded silicic tuff a/a quartz fragments common; 25% of lithics are from mafic volcanics; one fragment of subrounded dark gray metashale and remaining lithics are silicic volcanics, including pumice.
2170-2180	a/a	
2180-2190	a/a	
2190-2200	a/a	W/ tr. sulfides (chalcopryrite).
2200-2210	a/a	W/ minor mylonite
2210-2220	a/a	
2220-2230	a/a	
2230-2240	a/a	
2240-2250	a/a	
2250-2260	a/a	W/ tr. sulfides (pyrite) and tr. mylonite.
2260-2270	a/a	W/ minor silica filled fractures; also tr. metashale in lithic components of pumaceous eutaxitic tuff.

2270-2280	a/a	Gray green locally eutaxitic pumaceous cxl lithic welded silicic tuff.
2280-2290	a/a	
2290-2300	a/a	Note, quartz fragments continue to be strongly embayed throughout this unit.
2300-2310	a/a	W/ tr. mylonite, also tr. white clay altered fragments.
2310-2320	a/a	
2320-2330	a/a	
2330-2340	a/a	W/ tr. epidote.
2340-2360	a/a	
2360-2370	a/a	
2370-2380	a/a	
2380-2390	a/a	
2390-2400	a/a	
2400-2410		Green gray eutaxitic pumice bearing cxl lithic welded silicic tuff. Devitrified celadonite altered pumic fragments up to 3 mm long make up approximately 1% of rock volume. Cxl component make up from 2 to 8% of each volume and consists of: angular to subrounded, clear to embayed quartz; subangular clear feldspar w/ occasional black opaque minerals, occasionally magnetic. Lithic clasts make up from 20 to 70% of rock volume and consist of: black vitric dacite fragments up to 4 mm; mixed accidental tuff fragments; and tr. bright orange (hematite?) altered volcanic fragments up to 1 mm.
2410-2420	a/a	
2420-2430	a/a	W/ increase in lithic clast size, approximately 10% white altered tuff. Much altered to white clay.
2430-2440	80% 20%	Green gray to gray to white eutaxitic welded tuff. Mixed volcanic and volcanoclastic fragments w/ tr. pyrite.
2440-2450	60%	Green gray to gray to white secondary pyrite bearing eutaxitic welded tuff.
	40%	Dark gray intermediate to basaltic volcanic clasts and tuff, in part from larger lithic clasts in the gray green eutaxitic welded tuff; tr. mylonite.

2450-2460	a/a	W/ approximately 10% gray to brown gray tuffaceous sediments.
2460-2470	a/a	W/ continued mylonite.
2470-2480	a/a	
2480-2490	50%	Gray to green gray lithic rich cemented tuff.
	30%	Green gray to white eutaxitic welded tuff.
	20%	Mixed volcanic and tuffaceous sedimentary fragments.
2490-2500	a/a	
2500-2510	a/a	W/ 5% orange brown lithic cemented tuff.
2510-2520	a/a	W/ 30% orange brown lithic cemented tuff.
2520-2530	70%	Orange brown cxl bearing lithic, cemented to lightly welded tuff. Occasional cxls are clear angular feldspar fragments. Lithic fragments, up to 4 mm. are of mixed volcanics and comprise from 5 to 20% of the rock. Minor laumontite and tr. calcite also present.
	30%	Green gray to gray cxl lithic welded tuff, lithic rich cemented tuff.
2530-2540	a/a	W/ tr. mylonite.
2540-2550	a/a	
2550-2560	75%	Green gray to gray cxl lithic welded tuff and lithic cemented tuff.
	25%	Orange brown cxl bearing lithic cemented to lightly welded tuff.
2560-2570	a/a	
2570-2580	a/a	W/ tr. to minor mylonite.
2580-2590	a/a	
2590-2600	a/a	
2600-2610	a/a	
2610-2620	65%	Orange brown to brown cxl bearing lithic cemented tuff, w/ minor to moderate amount of mylonite. Vein minerals include tr. qtz, tr. calcite, and minor laumontite.
	35%	Green gray to green locally silicified eutaxitic welded tuff and lithic rich cemented tuff.

2620-2630		Interfingered orange brown to gray to gray green lithic and cxl lithic tuff w/ vein minerals a/a.
2630-2640	a/a	
2640-2650	a/a	W/ laumontite common and continued mylonite.
2650-2660	a/a	
2660-2670	90%	Casing cement.
	10%	Vari-colored gray brown to gray green crystal and lithic rich cemented to slightly welded tuffs. Lithic clasts usually mm size subangular pieces of volcanic flow rock. Secondary smectite, celadonite, laumontite, tr. pyrite, hematite.
2670-2680	60%	Brownish gray to light green gray crystal and lithic rich, cemented to welded tuffs, much possibly epiclastic. Cxls include plag., quartz, and sanidine; lithic clasts are predominantly subangular to subrounded and range in size from less than 1 mm to a few mm; and are mostly volcanic flow rocks of variable composition. Secondary minerals include much clay (smectites and celadonite), silica cement, zeolites including laumontite, hematite, tr. pyrite, and tr. corroded epidote.
	40%	Casing cement.
2680-2690	75%	Fine, less than 1 mm angular to subangular lithic chips, crystals and crystal fragments. Very little matrix material present. This is probably a poorly cemented volcanic sandstone. Occasional fragments of tuffs as above are observed.
	25%	Cement.
2690-2700	75%	Brown gray, fine tuffaceous material with sparse cxl and lithic clasts (palagonite?).
	20%	Casing cement.
	5%	Miscellaneous lithic clasts and bits of lithic rich ruff as above.
2700-2710	90%	Mixture of medium gray to grayish red brown indurated cxl lithic tuffs. Most noticeable is a medium gray granular crystal rich rock which could be dactic inclusions. Secondary silica, green clay (smectites and celadonite), much laumontite, some calcite, hematite, and tr. pyrite.
	10%	Casing cement.
2710-2720	90%	Brown gray to dark gray fine grained lithic tuff. Lithic clasts appear to be mainly basaltic material,

2710-2720 (cont.)
90% cxls are predominantly feldspar, with lesser qtz. Magnetite cxls are common, occasionally as inclusions in feldspar. Much secondary hematite, clay, zeolite including laumontite, tr. pyrite.
10% Casing cement.

2720-2730 a/a

2730-2740 a/a W/ a higher % of lithic components, perhaps more alteration.

2740-2750 90% Light gray to light greenish gray recrystallized porphyritic hornblende andesite. One or 2% dark green hornblende cxls, usually with reaction rims, in a sugary groundmass of plag., clays, and finely disseminated euhedral magnetite. The plagioclase may be partially albitized.

2750-2760 a/a

2760-2770
80% Trip sample
Light greenish gray recrystallized hornblende andesite. One to 2 mm brown green hornblende phenocrysts usually with some reaction rim, sometimes embayed, generally friable. Matrix is sugary mass of feldspar, light green clays, sparse disseminated magnetite, plus other unidentified minerals. Sparse yellow green augite(?)
20% Mixed uphole material including tuffs and cement.

2770-2780 95% Light gray to light greenish gray to occasional dark gray, sparse porphyritic hornblende andesite. Hornblende phenocrysts as above becoming rarer, rock appears fresher, may be entering a new, darker, aphyric flow
5% Vein fillings of laumontite, rarely associate w/ minor calcite.
Uphole slough.

2780-2790 a/a Note: this material is fairly altered; it is crushable with tweezers.

2790-2800 a/a Increasing vein zeolites, some clasts appear brecciated.

2800-2810 a/a

2810-2820 92% Very light gray to light greenish gray nearly aphyric hydrothermally altered basalt or basaltic andesite. Granular groundmass with fine disseminated magnetite throughout. No femic minerals in groundmass visible. Occasionally green stained plag. phenos (1 mm). Hornblende becoming less common.

2810-2820 (cont.)		
	5%	Uphole slough.
	3%	Secondary zeolites, usually as fracture fillers, includes laumontite and possibly heulandite.
2820-2830	60%	Grayish brown crystal and lithic rich devitrified tuff, probably epiclastic. Matrix totally altered to clay, cxls are altered white plag. and clear quartz, lithics are subround to angular bits of predominantly mafic rock, usually 1 mm or less in size. Concentration of lithics and cxls variable suggesting bedding in unit. Laminae rarely visible, no pumice noted. Secondary minerals include brown clay, green clay, hematite, occasional pyrite, euhedral to subhedral magnetite. Zeolites (laumontite and heulandite?) and quartz occur in veins.
2830-2840	a/a	W/ 95% brownish tuff.
2840-2850	a/a	Color varying from brownish to pastel green due to probable increase in celadonite. Green alteration appears to be more common in tuff containing relict pumice texture.
2850-2860	a/a	
2860-2870	a/a	
2870-2880	a/a	
2880-2890		Gray brown to gray green devitrified crystal lithic, welded silicic tuff. The lithic fragments are usually angular and harder than the matrix. Cxls include white and clear feldspar (sanidine?) and quartz. Relict pumice or glassy flow texture is common. Alteration minerals include clay, (in part celadonite), calcite, magnetite, hematite, and occ. pyrite. Vein minerals include zeolite, probably laumontite, and minor silica.
2890-2900	a/a	W/ some pieces of dark brown densely welded tuff.
2900-2910	95%	Brown to gray green devitrified crystal and lithic rich cemented to welded tuffs.
	5%	Uphole slough.
2910-2920	100%	Light brown to light pastel green devitrified crystal lithic silicic tuff. Angular to subrounded volcanic rock fragments up to 1 mm, and cxls of quartz and altered feldspar up to 1 mm in altered matrix of clay (incl. celadonite), silica, zeolite, and magnetite. Minor amounts of altered pumice are present. Abundant vein filling minerals include clear to white friable

2910-2920 (cont.)	100%	zeolite and minor calcite.
2920-2930	a/a	Becoming less green and more clastic.
2930-2940	a/a	
2940-2950	a/a	
2950-2960	a/a	
2960-2970	a/a	
2970-2980	a/a	
2980-2990	a/a	
2990-3000	a/a	
3000-3010		Light brown gray to light green gray devitrified cxl lithic tuff. Lithics include angular to subrounded volcanic lithic clasts and relict pumice. The cxl component includes plagioclase fragments and embayed quartz w/ opaque inclusions. Vein minerals include quartz, laumontite, and possibly heulandite. Other secondary minerals include clay, zeolites, silica, hematite, possible chlorite, and possible tr. epidote.
3010-3020	a/a	
3020-3030	a/a	
3030-3040	a/a	
3040-3050		Light gray to light greenish gray altered crystal and lithic rich tuff w/ variable textures.
3050-3060	a/a	
3060-3070		Light greenish gray to light gray cxl and lithic rich tuff. Angular to subrounded lithic clasts and cxls include feldspar and quartz in a matrix of clay, zeolite, silica, and calcite. A relic clastic texture is ubiquitous. Some silica cementing is apparent; laumontite is common, also some quartz veining and tr. epidote are present.
3070-3080	a/a	
3080-3090	100%	Light green gray to green gray eutaxitic metasomatized cxl lithic tuff. Cxls include subrounded quartz w/

3080-3090 (cont.) embayments and occasional specular hematite inclusions; sub to euhedral feldspar cxls, often cloudy from alteration; and subhedral specular hematite. Lithic fragments are volcanic from mixed sources, and constitute less than 15% of volume. Secondary minerals include minor vein silica and moderate amounts of laumontite. Mylonitized tuff makes up less than 1% of the sample.

3090-3100 100% Eutaxitic metasomatized tuff a/a w/ color change from green gray to a brown to reddish brown. Lithic and mineral assemblage continues a/a.

3100-3110 a/a W/ only tr. quartz.

3110-3120 80% Brown red cxl lithic tuff.
20% Gray to green gray cxl lithic tuff.

3120-3130 Brown red w/ minor gray to green gray eutaxitic cxl lithic tuff a/a, continued secondary laumontite.

3130-3140 a/a

3140-3150 a/a

3150-3160 a/a W/ secondary cryptocxln silica, laumontite and secondary K-spar.

3160-3170 100% Dark gray to dark green gray cxl bearing lithic rich locally eutaxitic tuff w/ localized celadonite alteration. Cxls include quartz, feldspar, and tr. specular hematite, calcite, and K-spar.

3170-3180 a/a W/ minor brown red tuff.

3180-3185 a/a

3185-3190 No samples recovered; washout.

3190-3200 85% Green gray to gray to brown metasomatized cxl lithic tuff. Cxls, up to 5% of rock volume, consist of angular quartz fragments, euhedral embayed quartz, subhedral to euhedral feldspar, and subhedral to euhedral specular hematite. The lithic fragments consist of subangular to rounded strongly altered volcanic fragments and make up less than 25% of rock volume. Secondary laumontite is present in tr. amounts.

15% Slough from uphole.

3200-3210 a/a W/ brown tuff continuing; w/ fewer cxls, and appears to have

3200-3210 (cont.)
a/a been cemented rather than welded.

3210-3220 a/a Continued laumontite and K-spar.

3220-3230 a/a

3230-3240 a/a Predominantly dark gray to dark red brown, locally well sorted.

3240-3250 a/a

3250-3260 a/a Becoming moderately to strongly silica metasomatized.

3260-3270 100% Dark green gray to dark gray to red gray silica metasomatized cxl lithic tuff w/ volcanic fragments making up to 70% of rock volume. Cxl volume is less than 1% and consists of clear feldspar w/ lesser clear quartz and subhedral specular hematite. The tuff is pervasively metasomatized w/ silica, w/ subsequent minor secondary laumontite.

3270-3280 a/a W/ increased laumontite

3280-3290 a/a W/ very little silica metasomatism.

3290-3300 100% Dark green to gray to red brown cxl lithic cemented tuff w/ minor silica metasomatism. Secondary laumontite common, secondary calcite rare.

3300-3310 a/a

3310-3320 a/a

3320-3325 No sample. Rig shut down w/o bottoms up.

3325-3330 100% Dark brown gray to green gray cxl pumice bearing lithic tuff. Pumice fragments are rare and highly altered, usually to celadonite and other clays. Cxls make up less than 1% of volume, and consist of feldspar w/ lesser quartz and specular hematite. Lithic fragments are composed of altered mixed volcanics. Secondary minerals include much laumontite, tr. calcite. Tr. slough from hornblende porphyritic andesite.

3330-3340 a/a

3340-3350 a/a

3350-3360 a/a Cxl bearing lithic tuff w/ possible tuffaceous sediments.

3360-3370	a/a	W/ abundant laumontite and local salmon colored secondary K-spar; tr. pearly white mica (sericite?); tr. finely cxln pyrite associated with fracture filling laumontite; tr. mylonite. Up to 20% of sample may be tuffaceous sediments.
3370-3380	a/a	Dark gray to dark green gray, locally brown cxl bearing lithic tuff w/ abundant secondary laumontite and possibly other zeolites, often as fracture or vein filling; tr. mylonite.
3380-3390	a/a	
3390-3400	a/a	
3400-3410	a/a	
3410-3420	a/a	W/ tr. secondary salmon colored K-spar.
3420-3430	a/a	W/ tr. to minor mylonite.
3430-3440	a/a	Dark gray green to dark gray, locally brown gray, locally silicified, cxl bearing lithic tuff. Cxls include clear feldspar and tr. clear quartz. Lithic content varies, w/ maximum up to 30% of rock volume, consisting of mixed volcanic fragments. Secondary laumontite is common along veins and fractures. Tr. secondary salmon colored K-spar occurs in tuff and volcanic fragments. Tr. mylonite is present.
3440-3450	a/a	
3450-3460	a/a	
3460-3470	a/a	
3470-3480	a/a	Predominantly dark brown gray tuff, w/ 5% green gray strongly clay and chlor altered fine grained andesite.
3480-3490	95%	Dark green gray strongly clay and chlor altered plag. hornblende prophyritic andesite.
	5%	Brown gray cxl bearing lithic tuff.
3490-3500		Dark gray brown to dark gray cxl bearing lithic tuff.
3500-3510	100%	Dark green gray to dark brown gray locally strongly silicified cxl bearing lithic tuff. Minor cxl content predominantly metasomatically altered feldspar. Lithic fragments are mixed volcanic. Secondary laumontite is common. Secondary pyrite occurs in very small cxls, usually concentrated w/ cryptocxln silica in the metasomatized fragments. Minor mylonite present throughout.

3510-3520	a/a	
3520-3530	a/a	Continuing mylonite.
3530-3540	a/a	
3540-3550		Dark brown gray to dark green gray lithic tuff; similar to above though w/ only minor silica metasomatization and corresponding reduction in secondary pyrite.
3550-3560	a/a	
3560-3570		Dark brown gray, locally dark green gray (celadonite alteration?) strongly silicified cxl lithic tuff. Cxls compose less than 2% of rock volume, and are predominantly angular quartz fragments and feldspar altered by metasomatism, w/tr. specular hematite. Lithics make up from 5 to 20% of rock volume and consist of strongly altered volcanic fragments. Secondary laumontite as fracture filling is common, w/ minor chlorite.
3570-3580	a/a	
3580-3590	a/a	
3590-3600	a/a	W/ minor mylonite.
3600-3610	a/a	
3610-3620	a/a	W/ increased mylonite.
3620-3630	90%	Strongly sheared and clay altered tuff a/a, altered to light gray to white w/ much silica metasomatism, minor secondary pyrite.
	10%	Gray green to dark gray green, chloritized and clay altered plag. hornblende and augite porphyritic andesite.
3630-3640	60%	Brown to white extremely altered lithic tuff.
	40%	Dark green gray chloritized and clay altered aphanitic plag. Hornblende and augite porphyritic andesite w/ tr. secondary laumontite and pyrite.
3640-3650	90%	Green gray altered porphyritic andesite w/ minor secondary laumontite.
	10%	Brown to white altered lithic tuff.
3650-3660	a/a	
3660-3670	90%	White to light gray metasomatized welded silicic tuff. Textures indicate a cxl vitric tuff with plagioclase (or K-spar?) minor femic component, pumice lapilli, glass shards, and a minor lithic component. Secondary minerals

3660-3670 (cont.)		
	90%	include silica (including cristobalite), calcite, and clay, chlorite, and occasional hematite. Vein minerals include calcite, quartz, and minor unidentified zeolite.
	10%	Porphyritic andesite a/a.
3670-3680	a/a	
3680-3690	a/a	
3690-3700	75%	Light to medium greenish gray altered and moderately indurated cxl lithic tuff. 10% sub mm angular lithic clasts (volcanic), 5% crystals of quartz and altered feldspar. Secondary clay, chlorite (?), quartz, magnetite and hematite. Veins and localized occurrences of calcite, laumontite (?), and tr. pyrite.
	25%	Welded silicic tuff a/a.
3700-3710		Greenish gray to brownish gray altered and slightly indurated cxl lithic tuff. Variable sizes and concentration of angular lithic clasts (1 mm and smaller), cxls of quartz, altered feldspar (some is definitely plag.). Some epidote replaces feldspar. Matrix is altered to clay, hematite, silica species, minor calcite, chlorite, tr. pyrite. Veins consist of calcite and zeolites.
3710-3720	80%	Light greenish gray to medium gray recrystallized augite, hornblende, porphyritic andesite with minor disseminated magnetite.
	20%	Cxl lithic tuff a/a.
3720-3730	90%	Brownish gray cxl lithic tuff a/a.
	10%	Augite hornblende andesite.
3730-3740	a/a	
3740-3450	a/a	
3750-3760	a/a	
3760-3770	100%	Brown gray, locally green gray, devitrified, cemented lithic tuff. Angular to subrounded lithic clasts of mostly mafic composition, usually less than 1 mm compose 50% of rock volume. The remainder is moderately indurated devitrified tuff with much secondary clay, hematite, chlorite, SiO ₂ and minor zeolite. Occasional cxls of clear plag. and quartz are the only remaining primary minerals. Up to 5% of the rock consists of laumontite, massive calcite, occasional drusy quartz, and small pods of chlorite in veins.

3770-3780	a/a	
3780-3790	a/a	Increase in lithic component.
3790-3800	40%	Dark gray to very dark green chloritized, and locally albitized meta-basalt. Rock contains secondary albite, chlorite, magnetite, zeolite, possible epidote. No good relict textures remain.
	35%	Brown gray cemented lithic tuff.
	25%	White friable secondary minerals including abundant laumontite, with lesser calcite, heulandite and chlorite.
3800-3810	60%	Meta-basalt/andesite a/a, becoming slightly less altered.
	25%	White secondary minerals as above.
	15%	Tuffs as above.
3810-3820	50%	White secondary minerals as above, including much laumontite and chlorite, with lesser calcite, tr. pyrite.
	50%	Gray to dark green gray chloritized, locally albitized meta-basalt.
3820-3830	40%	Brown to green gray devitrified, cemented lithic tuff.
	40%	Gray to dark gray meta-basalt w/ relict porphyritic texture occasionally visible. Minor sheared fragments are present.
	20%	Vein filling zeolites, calcite, and chlorite (as coatings and in pods).
3830-3840	95%	Greenish to brownish gray devitrified cemented to welded lithic tuff. Alteration makes estimation of % lithic component difficult. Tuff and clasts are altered to clay, silica, hematite, chlorite, calcite, and laumontite. Most lithics are less than 1 mm.
3840-3850	a/a	
3850-3860	a/a	
3860-3870	a/a	W/ tr. epidote; lithics up to 40% of rock volume.
3870-3880	100%	Brownish gray to locally greenish gray, devitrified, cemented to welded tuff. 30% sub mm angular to sub-rounded, mostly mafic, lithic clasts. Small % of white altered feldspar cxls. Minor amount unidentified zeolites occurring in veins. Secondary minerals include clay, hematite, silica, chlorite and minor calcite.
3880-3890	a/a	
3890-3900	a/a	

3900-3910 a/a

3910-3920 a/a W/ increase in vein zeolite, calcite, and chlorite.

3920-3930 a/a

3930-3940 a/a

3940-3950 100% Grayish brown devitrified cemented lithic tuff. 20% dark gray, angular to subrounded, basaltic lithic clasts (less than 1 mm). Relict primary minerals consist of a minor % of white altered feldspar cxls, and occasional specular hematite cxls. Secondary minerals include clay, hematite, silica, and chlorite. Sparse veins consist of laumontite, occasionally associated w/ chlorite, calcite and tr. pyrite.

3950-3960 a/a

3960-3970 a/a

3970-3980 Dark gray to brownish gray locally greenish gray, devitrified cemented lithic tuff. 20 to 25% altered lithic clasts of mafic composition. Minor cxl component of the tuff consist of white altered plag. Tuffaceous matrix is mostly altered to clay, silica, hematite, zeolites, calcite, minor chlorite, and magnetite. Vein fillings consist of heulandite and possible laumontite, often associated w/ chlorite, tr. pyrite, and minor calcite, making up 2 to 3% of rock volume.

3980-3990 a/a

3990-4000 a/a W/ tr. epidote, and possible local albitization.

4000-4010 a/a

4010-4020 a/a

4020-4030 Orange red to red gray devitrified and cemented lithic tuff. Orange red material shows relict glass shard textures. Feldspar and quartz cxls are present but sparse, feldspars are altered white. Mafic lithic clasts make up 20% of total volume. Tuffaceous material is devitrified and cemented w/ clay, zeolite, and SiO₂. Secondary zeolite, chlorite, and calcite occur in veins and rocks. Hematite staining is pervasive. Chlorite occurs in altered mafic clasts, and as pods and veins.

4030-4040 a/a

4040-4050 a/a

4050-4060 a/a

4060-4070 a/a

4070-4080 100% Reddish brown devitrified, cemented cxl bearing lithic tuff consisting of 10-20% altered mafic angular to sub-round mm size lithic clasts; 10% cxls of altered feldspar, and minor quartz. Secondary minerals include clay, hematite, zeolite, minor calcite, chlorite, and tr. pyrite. Zeolite, calcite, and associated chlorite occur as vein fillings.

4080-4090 85% Reddish gray to dark gray lithic tuff as above.
15% White secondary vein minerals including zeolites (probably laumontite and heulandite) clear rhombs of calcite, and minor chlorite.

4090-4100 a/a W/ secondary vein minerals down to 5%.

4100-4110 a/a

4110-4120 a/a

4120-4130 a/a

4130-4140 Brown gray to green gray devitrified metasomatized cxl lithic tuff. Altered feldspar cxls make up 3 to 5% of rock volume. Angular to subangular mafic lithic clasts make up from 10 to 20% of rock volume. Secondary minerals include clay, chlorite, hematite, calcite and laumontite. Mylonite is present.

4140-4150 a/a

4150-4160 a/a W/ continued mylonite present.

4160-4170 100% Brown gray cxl bearing lithic tuff. Cxls of euhedral to subhedral plagioclase, which has been partially altered to clay, make up approximately 3% of the rock volume. Angular to subangular chloritized lithic clasts make up to 15% of the rock volume. Occasional tuff fragments show evidence of shearing.

4170-4180 a/a W/ lithic clasts predominantly from mafic lava.

4180-4190 a/a W/ occasional pods of chlorite.

4190-4200 a/a W/ tr. pyrite.

4200-4210 a/a Including laumontite vein fillings.

4210-4220 a/a

4220-4230 Dark gray to green gray to brown gray devitrified cxl bearing lithic tuff. Minor cxls consist of clear to cloudy fragments of euhedral feldspar and tr. euhedral to subhedral magnetite. Lithic fragments are strongly clay altered, and appear to be derived from mixed volcanic sources. Secondary minerals, usually associated w/ the green gray colored tuff, consist of laumontite, and possibly other zeolites, pyrite, chlorite, and tr. calcite; and most commonly occurs in veins.

4230-4240 a/a W/ chlorite rich dark green gray mylonite.

4240-4250 a/a W/ increase in secondary calcite, continued mylonite.

4250-4260 a/a

4260-4270 a/a W/ minor dark gray aphanitic plag. porph. lava.

4270-4280 70% Gray to dark gray silicified tuff w/ relict feldspar cxls, associated w/ secondary calcite, and tr. laumontite.
25% Dark gray brown to red brown magnetite, quartz, feldspar bearing lithic tuff.
5% Dark green to light gray mylonite.

4280-4290 90% Gray to dark gray, locally silified, sheared altered tuff, w/ abundant veins; secondary minerals include laumontite w/ lesser amounts of calcite, and silica.

4290-4300 a/a W/ only minor silicification.

4300-4310 a/a

4310-4320 a/a

4320-4330 90% Gray to light gray green to brown strongly clay altered lithic tuffs w/ minor feldspar cxls.
10% Secondary laumontite w/ lesser amounts of calcite, locally minor chlorite and pyrite.

4330-4340 100% Gray green strongly clay altered cxl bearing lithic tuff. Minor cxl component consists of cloudy feldspar and magnetite. Altered lithics are of mixed volcanics. Secondary minerals include clay, calcite, laumontite w/ minor chlor, tr. pyrite, and tr. epidote.

4340-4350 a/a W/ tr. mylonite.

4350-4360 a/a

4360-4370 a/a

4370-4380 a/a W/ slight increase in chlorite.

4380-4391 No sample due to trip.

4391-4400 Mixed tuff fragments, from light gray green to dark gray to orange, apparently slough from uphole after trip.

4400-4410 a/a

4410-4430 No sample due to twist off.

4430-4440 Medium gray to brown gray cxl bearing, very clay altered lithic tuff. Angular to subrounded volcanic lithic clasts and sparse milky feldspar cxls all show alteration to clay, hematite, chlorite, zeolites, calcites and pyrite. Alteration variable, pieces w/ evidence of vein filling generally show most intense alteration. Vein minerals include laumontite, calcite, chlorite and pyrite.

4440-4450 a/a

4450-4460 a/a W/ some pyrite altering to hydrous Fe oxide.

4460-4470 a/a Minor shearing and mylonitization w/ secondary zeolite cementing and some vein silica.

4470-4480 a/a

4480-4490 a/a

4490-4500 a/a

4500-4510 a/a Rock has taken on a greenish color, and appears to be more intensely altered with a higher degree of silicification.

4510-4520 100% Dark gray to medium gray holocxln augite and plag. porphyritic subvolcanic basalt. Groundmass shows chlorite and clay alteration, w/ minor zeolite and magnetite. Plag. phenocrysts remain quite clear, but often have opaque inclusions along cleavage planes. A clear brown anhedral augite is also present as a phenocryst phase. Pyrite is present in small amounts. Vein minerals include laumontite, calcite and cryptocxln SiO₂, pyrite, and chlorite.

4520-4530 a/a Some hydrous Fe oxides after pyrite.

4530-4540 a/a

4540-4550	a/a	
4550-4560	a/a	
4560-4570	99%	Dark gray to dark greenish gray coarsely plag. porphyritic holocxln basaltic shallow intrusive. Groundmass shows clay and chlorite alteration with occasional pyrite. Clear twinned plag. up to 1 mm, with opaque inclusions commonly, makes up to 20% of this rock. Clear brown augite, showing very poor cleavage makes up a small % of phenocryst assemblage. Vein minerals include laumontite, cryptocxln, SiO ₂ , calcite, and occasional chlorite. Pyrite is commonly associated with all these.
	1%	Soft black serpentine.
4570-4580	a/a	
4580-4590		W/ 5% laumontite in veins.
4590-4600	a/a	
4600-4610	a/a	W/ 1% serpentine.
4610-4620	98%	Very dark green augite plag. porphyritic holocxln basaltic shallow intrusive as above. Vein minerals are more common and include laumontite, calcite, pyrite, chlorite, and cryptocxln SiO ₂ in decreasing order.
	2%	Dark green soft serpentine.
4620-4630	a/a	
4630-4640	a/a	W/ increase in vein zeolites.
4640-4650	a/a	
4650-4660	80%	Light greenish gray strongly metasomatized lithic tuff. Original clastic texture barely visible through intense silicification. This may be a contact altered zone from the intrusive above.
	20%	Very dark green augite plag. porphyritic basalt a/a.
4660-4670	90%	Light greenish gray strongly metasomatized lithic tuff. Unit is altered w/ secondary minerals including clay, albite, silica, and locally pyrite, zeolite, epidote, and specular hematite.
	10%	Uphole material a/a.
4670-4680	a/a	Reduced metasomatism; increased laumontite.
4680-4690	a/a	

4690-4700 a/a

4700-4710 a/a

4710-4720 a/a

4720-4730 Greenish gray to brownish gray metasomatized lithic tuff. Rock is recrystallized to clay, albite, silica, chlorite, with specular hematite, pyrite, tr. epidote, minor calcite. Alteration variable and appears to be vein controlled; vein minerals include zeolites, (laumontite?) pyrite, chlorite, and tr. epidote.

4730-4740 Brownish gray to locally greenish gray devitrified and partially silicified cxl lithic tuff.

4740-4750 Brownish gray to greenish gray, devitrified cemented cxl lithic tuff. Secondary minerals include clay, silica, hematite, and locally, pyrite, chlorite, specular hematite, zeolites, w/ occasional epidote. The cxl content is mostly white altered plag. The lithics are angular to subround mixed volcanic fragments, always altered, w/ occasional pumice relicts.

4750-4760 a/a

4760-4770 a/a W/ laumontite vein fillings, occasional epidote, and some mylonite.

4770-4780 a/a

4780-4790 a/a

4790-4800 a/a

4800-4810 100% Dark gray cxl bearing lithic tuff. Cxls consist of occasional feldspar that is usually cloudy and may have been albitized. Lithic fragments appear to be derived from intermediate to mafic volcanics and compose from as little as 5% to as much as 80% of total rock volume, w/ the average at 30%. Very fine cxln clear to white zeolite contributes to the cementing of this tuff. Secondary minerals include clay, minor laumontite, and minor calcite.

4810-4820 a/a

4820-4830 a/a

4830-4840 a/a

4840-4850 a/a W/ 2-3% green gray silicified and pyrite bearing veins w/ chlorite and fragments of feldspar. Alteration appears to be related to the mafic intrusive event observed in the 4600' samples. Minor to tr. very dark green soft mylonite also present.

4850-4860 a/a

4860-4870 a/a W/ tuff becoming green gray; w/ increased clay and chlorite alteration.

4870-4880 Tuff a/a, here green gray clay and chlorite altered, moderately to strongly silica metasomatized and w/ tr. pyrite.

4880-4890 a/a W/ 20% dark orange gray less altered tuff as in samples above 4840'.

4890-4900 a/a W/ 50% dark orange gray, less altered, lithic tuff. 50% gray green clay and chlorite altered lithic tuff.

4900-4910 a/a W/ 80% dark orange gray lithic tuff.

4910-4920 a/a Tr. mylonite.

4920-4930 a/a

4930-4940 Dark green gray clay and chlorite altered cxl bearing lithic tuff. Minor cxls consist of plagioclase; many appear to have been albitized. Locally the tuff has undergone silica metasomatization. Additional secondary minerals include laumontite, calcite, and tr. pyrite.

4940-4950 a/a Dark green gray to orange gray.

4950-4960 a/a

4960-4970 a/a

4970-4980 a/a W/ tr. secondary epidote as groundmass alteration in the dark orange gray lithic tuff.

4980-4990 a/a

4990-5000 a/a

5000-5010 a/a

5010-5020 a/a W/ green gray pyrite bearing silica and chlorite veins, and occasional plagioclase fragments; probably associated w/ the intrusive @ 4600'.

5020-5030 100% Dark orange gray cxl bearing lithic tuff a/a w/ 35% chlorite and clay alteration, giving a green gray color. Secondary laumontite and minor calcite occurs more often w/ the green gray altered tuff. Occasional drusy laumontite cxls, up to 8 mm, suggest voids in rocks.

5030-5040 a/a W/ moderate shearing, increased clay alteration.

5040-5050 a/a W/ lithic component ranging from 10% to 80% of rock fragment volume, averaging near 65%. Abundant zeolites observed in matrix.

5050-5060 a/a

5060-5070 a/a

5070-5080 a/a W/ minor drusy laumontite, abundant laumontite cementing.

5080-5090 a/a

5090-5100 a/a

5100-5110 100% Dark orange gray devitrified cxl bearing lithic tuff. Occasional cxl fragments of feldspar and magnetite. Clay and chlorite altered lithic fragments are from intermediate mafic volcanic sources, and make up from 10 to 50% at the rock volume. Secondary minerals include clay, moderate to minor laumontite, calcite, and locally chlorite. Silica and occasional pyrite veins are associated w/ minor green gray chlorite and clay altered zones.

5110-5120 a/a W/ lithic fragments equal to less than 10% of rock volume.

5120-5130 a/a

5130-5136 a/a W/ lithic component making up to 30% of rock volume, tr. secondary pyrite in veins.

5136-5150 No returns; washout.

5150-5160 100% Dark orange gray, locally green gray cxl bearing lithic tuff.

5160-5170 a/a

5170-5180 a/a

5180-5190 a/a W/ increase in secondary laumontite and calcite.

5190-5200 a/a

5200-5210 a/a

5210-5220 a/a W/ minor localized secondary specular hematite.

5220-5230 a/a

5230-5240 a/a

5240-5250 100% Dark gray to dark orange gray devitrified cxl bearing lithic tuff, locally grading to a lithic bearing tuff. Mixed volcanic lithic fragments make up from less than 1 to 30% of rock fragment volume. Secondary minerals include clay, laumontite, calcite, minor chlorite, tr. pyrite, and tr. to minor specular hematite and hydrous Fe oxides (subsequent to, and locally at the expense of pyrite).

5250-5260 a/a W/ tr. sheared fragments.

5260-5270 a/a

5270-5280 a/a

5280-5290 a/a

5290-5300 a/a W/ up to 20% dark gray, very fine grained w/ occasional micro-vesicles, possibly a welded zone.

5300-5310 90% Dark orange gray devitrified tuff and lithic tuff a/a.
10% Green gray altered cxl bearing lithic tuff w/ secondary clay, chlorite, laumontite, cryptocxln silica. Tr. calcite, and tr. pyrite.

5310-5320 a/a W/ general increase in silicification; clay alteration.

5320-5330 100% Dark gray to dark orange gray devitrified, locally eutaxitic, cxl bearing lithic tuff. Cxls consist of clear to occasionally cloudy feldspar fragments w/ lesser amounts of euhedral to subhedral magnetite. Lithics consist of mixed intermediate to mafic volcanic fragments, and make up from 5% to 25% of rock volume. Secondary minerals include clay, laumontite, minor calcite, minor hydrous Fe oxides, and tr. cryptocxln silica, tr. chlor.

5330-5340 a/a

5340-5350 a/a

5350-5360 a/a W/ 40% green gray, clay altered lithic tuff w/ secondary chlorite common, and occasional concentrations of pyrite.

5360-5370 a/a W/ minor secondary K-spar.

5370-5380 Predominantly orange gray cxl bearing lithic tuff a/a w/ minor green gray clay and chlorite altered fragments. Secondary minerals continued a/a.

5380-5385 a/a

5385-5400 No sample recovered, trip.

5400-5410 Dark gray to dark orange gray cxl bearing lithic tuff w/ abundant secondary hematite and hydrous Fe oxides, minor clay, laumontite, and tr. calcite.

5410-5420 a/a W/ lesser Fe oxidate and minor green gray tuff fragments associated w/ cryptocxln silica and minor pyrite.

5420-5430 a/a W/ tr. mylonite.

5430-5440 a/a

5440-5450 a/a W/ slight increase in silicification and associated pyrite.

5450-5460 60% Brown gray to orange gray quartz bearing tuff, locally silicified, and associated w/ pyrite bearing silica veins.
40% Dark orange gray to green gray cxl bearing lithic tuff.

5460-5470 70% Orange brown to light brown gray quartz and feldspar bearing tuff, may have originally been welded.
30% Light brown gray to white pyrite bearing silicified tuff and silica veins.

5470-5480 80% Dark orange brown feldspar and magnetite bearing lithic tuff w/ some fragments showing eutaxitic texture, minor secondary Fe oxides, laumontite, chlorite, and tr. calcite.
20% Orange brown to light brown gray tuff and silicified tuff.

5480-5490 Orange brown to dark orange brown to gray plag. and magnetite bearing lithic tuff, often showing eutaxitic texture. Secondary minerals include minor clay, Fe oxides, laumontite, chlorite, and tr. calcite and pyrite.

5490-5500 No sample due to twist-off.

5500-5510 Orange brown to red brown devitrified cxl bearing lithic tuff. Uniform clay rich matrix with various sizes sub mm to 2-3 mm angular to subrounded lithic clasts up to 10-15%, occasional eutaxitic texture present. Sparse subhedral to euhedral cxls of quartz present. Secondary vein minerals include laumontite, calcite, chlorite, and tr. pyrite.

5510-5520 a/a W/ increase in proportion of lithic clasts.

5520-5530 75% Dark brownish gray devitrified lithic tuff, with much smaller % of lithic clasts. Secondary minerals a/a.
25% Orange brown cxl bearing lithic tuff a/a.

5530-5540 75% A/a.
25% Secondary minerals are mostly soft white to clear cxln laumontite, with lesser calcite minor chlorite and tr. Fe oxides.

5540-5550 Brown gray to red brown devitrified lithic tuff. Many lithic clasts show chlorite alteration. Secondary minerals a/a but make up less than 5% of rock volume.

5550-5560 90% Gray brown to light red brown devitrified, locally cemented, lithic tuff with much clay and Fe oxide alteration.
10% SiO₂, minor chlorite, tr. pyrite and Fe oxides.

5560-5570 a/a

5570-5580 a/a

5580-5590 a/a W/ darker color and less Fe oxidation.

5590-5600 a/a 2-3% white laumontite.

5600-5610 Brown gray to purple brown gray welded to cemented cxl bearing lithic tuff. Sparse cxls of quartz and white feldspar. 2-3% secondary laumontite w/ tr. hematite and tr. calcite.

5610-5620 a/a W/ much of the laumontite as vein fillings, associated w/ minor to tr. pyrite and Fe oxides. An increasing % of this material is welded.

5620-5630 100% Red brown to gray brown welded to cemented lithic tuff, occasionally glass shards and eutaxitic texture visible. Most lithics appear to be mafic. Lithics are angular to subrounded, most are sub mm, and unsorted, making up to 20% of the total rock volume. Secondary minerals

5620-5630 (cont.)	100%	include clay, iron oxides, minor calcite, and zeolites in the groundmass. Laumontite, calcite, cryptocrln SiO ₂ , minor clay, chlorite, tr. specular hematite and heulandite occur in fractures and vugs.
5630-5640	a/a	W/ increase in lithic component, minor mylonization and increasing degree of cementing.
5640-5650	a/a	
5650-5660	a/a	Increase in cementation and alteration.
5660-5670	100%	Dark brown gray to dark red gray devitrified cemented lithic tuff. Similar to above but it appears more altered, the color is much darker, and the lithic clasts are difficult to distinguish from tuffaceous matrix.
5670-5680	a/a	
5680-5690	75%	A/a
	20%	Gray to green gray, altered granular fine grained subvolcanic basalt/andesite.
	5%	Secondary laumontite, calcite, with traces of pyrite, chlorite, and minor fine dark opaque minerals.
5690-5700	90%	Light gray, altering to light green gray, aphanitic granular subvolcanic basalt/andesite. Groundmass is uniform, fine sugary textured mass of plag., green clay, minor calcite, and fine disseminated magnetite. In the less altered clasts, a pilotaxitic texture can be seen. Some clasts show relict phenocrysts with diffuse edges, which have been altered to zeolite, clay, and minor calcite. Rarely observed are relict ferromag. phenocrysts that are altered to clay, zeolite, and magnetite. No vesicles or other typical flow top features are observed.
	5%	Secondary (mostly vein) minerals including laumontite, calcite, and tr. greenish clay.
	5%	Uphole slough.
5700-5710	a/a	W/ magnetite locally altering to hematite.
5710-5720	a/a	W/ some pyrite.
5720-5730	a/a	
5730-5740	50%	Very inhomogeneous sample. White to light green, intensely altered and silicified lithic tuff. Includes much clay, chlorite (?), calcite,

5730-5740 (cont.)

- 50% siliceous cement, magnetite, and pyrite.
25% Light green fine grained altered intrusive a/a.
20% Tuff and lithic clasts in varying states of alteration;
includes some uphole slough.
5% Secondary minerals including laumontite and lesser
calcite veins, tr. pyrite.
- 5740-5750 90% Light gray to light green gray fine grained granular
altered hornblende bearing intrusive as above.
5% Altered tuffs.
5% Secondary minerals consist mostly of laumontite, w/
lesser calcite and cryptocxln SiO₂, often associated w/
pyrite. Some mylonite is observed in this sample.
- 5750-5760 a/a
- 5760-5770 50% Light green altered intrusive a/a.
50% Dark brown altered welded lithic tuffs w/ relict
eutaxitic texture still visible. Occasionally primary
euhedral magnetite cxls are present. The tuff has been
locally silicified.
- 5770-5780 90% Dark brown gray, altered, welded to cemented, cxl
bearing lithic tuff. Secondary minerals include
clay, Fe oxides, laumontite, minor calcite, and tr pyrite.
10% Light green altered intrusive a/a.
- 5780-5790 a/a
- 5790-5800 85% Light gray to light green gray fine granular sparsely
porphyritic plag. hornblende subvolcanic basalt/andesite.
Phenocrysts are moderately to strongly altered. Ground-
mass consists of plagioclase and fine disseminated mag-
netite w/ secondary clay and calcite.
15% Dark brown gray cxl bearing lithic tuff.
- 5800-5810 a/a Noticeable scarcity of vein minerals.
- 5810-5820 Light gray to light green gray sparsely porphyritic
fine granular altered subvolcanic basalt/andesite.
The groundmass is a holocxln mass of locally pilotaxitic
plag. green and white clays, minor calcite, and fine
disseminated magnetite. Phenocrysts compose less than
5% and are mostly plag. altering to clay, zeolite,
calcite, and hornblende w/ well developed reaction rims.
- 5820-5865 No samples due to washout.
- 5865-5870 95% Green gray clay and chlorite altered augite bearing
hornblende porphyritic andesite w/ local silicified zones.

6030-6040 a/a W/ decrease slough from uphole.

6040-6050 a/a

6050-6060 a/a Brown to red brown, locally eutaxitic cxl and lithic bearing, welded to cemented tuff, w/ minor andesite slough from uphole.

6063-6065 Fault: abundant mylonitized red brown tuff, no indication of fluid movement, no mineralization.

6065-6070 100% Brown gray to red brown cemented cxl bearing lithic tuff, w/ minor welded tuff. Cxls consist of feldspar fragments and tr. quartz fragments, also tr. magnetite. Lithics are clay altered volcanic fragments, making up from tr. to 15% of rock fragment volume. Secondary minerals include clay, tr. hematite, tr. laumontite.

6070-6080 a/a

6080-6090 a/a

6090-6100 a/a

6100-6110 a/a

6110-6120 a/a

6120-6130 a/a

6130-6140 a/a

6140-6150 Brown gray to brown, locally eutaxitic cxl lithic tuff w/ both cemented and welded fragments present. Cxls consist of angular to subrounded fragments of quartz and feldspar (sanidine) never amounting to more than 2% of rock volume, The lithic component consists of angular to rounded mixed volcanic fragments, often both heat and clay altered. In the welded zones some lithic fragments have undergone plastic deformation. The lithic fraction makes up from 1 to 20% of the total rock volume. Secondary mineralization appears to be limited to clay, w/ possibly a tr. of laumontite.

6150-6160 a/a

6160-6172 a/a W/ tr. secondary calcite and laumontite.

6172-6174 Fault: abundant mylonitized brown tuff, w/ no
 subsequent mineralization.

6174-6180 Brown gray to brown cxl lithic tuff, predominantly
 cemented.

6180-6190 a/a

6190-6200 a/a W/ tr. dipyrarnidal (Herkimer) quartz cxls.

6200-6210 a/a

6210-6220 a/a

6220-6230 a/a W/ continued tr. laumontite.

6230-6240 No sample due to washout and trip.

6240-6250 90% Gray brown to red brown cxl and lithic bearing tuff.
 5% Mylonitized red brown tuff.
 5% Green gray to dark green plag. porphyritic andesite w/
 associated silicification.

6250-6260 100% Gray brown to red brown cxl and lithic bearing tuff,
 commonly cemented w/ local eutaxitic fragments. The
 cxls include traces of feldspar, occasionally cloudy;
 traces of quartz fragments, and tr. of euhedral mag-
 netite. The lithic fragments consist of altered volcan-
 ics. Secondary clay alteration is common, and locally
 quite intense.

6260-6270 50% Gray brown to red brown tuff a/a.
 50% Green gray to dark green gray fine to medium cxln plag.
 porphyritic diorite w/ abundant secondary chlorite
 (relict mafic cxls), clay, silica, disseminated magnetite,
 moderat calcite, minor laumontite, and tr. pyrite.

6270-6280 60% Green gray to dark green gray fine to medium cxln
 diorite, w/ tr. remnant hornblende phenocrysts. Most
 mafic minerals have been totally chloritized. In the
 zones of silica metasomatization the plag. appears to
 have been albitized. Additional secondary minerals a/a.
 40% Gray brown to red brown tuff a/a.

6285-6287 80% Gray brown to red brown tuff a/a, w/ scarce mineralized
 zones containing pyrolusite and native copper.
 20% Green gray to dark green gray diorite a/a.

6285-6290 95% Gray brown to red brown cxl and lithic tuff a/a w/ minor
 mylonite. Tr. native copper associated w/ translucent
 white clay. Other secondary minerals include clay, tr.
 laumontite and local chlorite.

6285-6290 (cont.)	5%	Dark green gray intrusive fragments.
6290-6300	100%	Brown tuff a/a.
6300-6310	a/a	
6310-6320	100%	Red brown to gray brown devitrified cxl lithic tuff. Cxl component consists of altered plagioclase, clear quartz, and occasional euhedral magnetite. The lithic clasts are mostly less than 1 mm, usually show clay or chlorite alteration. Secondary minerals include clay, hematite, minor chlorite, laumontite, tr. calcite.
6320-6330	a/a	W/ minor mylonite.
6330-6340	80%	Brown tuff a/a.
	20%	Light to medium greenish gray intrusive fragments.
6340-6350	a/a	W/ an increase in the amount and size of the lithic clasts in the tuff; also tr. secondary pyrite.
6350-6360	50%	Brown tuff as above.
	30%	White to very light green metasomatized tuff. Tuffaceous material has been recrystallized to a very light colored mixture of albite, calcite, minor chlorite, probably cryptocxln SiO ₂ . Relict clastic texture is recognizable. Quartz clasts are for the most part unaffected or show overgrowths, rarely. Fe oxides occur in minor amounts.
	20%	Medium green gray to medium gray, lightly chloritized and albitized lithic volcanic clasts. Most show alteration of the groundmass to albite, chlorite, clay and calcite; and recrystallization of the plagioclase phenocrysts to albite, calcite and zeolites.
6360-6370	70%	White to very light green white metasomatized tuff a/a, w/ tr. pyrite present.
	30%	Brown tuff a/a.
6370-6380	a/a	
6380-6390	70%	White to very light green strongly metasomatized tuff. Secondary minerals include albite, clay, chlorite, calcite, and zeolite. Relict texture obscured but present.
6390-6400	a/a	W/ calcite and chlorite occurring in localized pods, and as fracture fillings. Minor mylonite and serpentine present.

6400-6410 50% Brown gray to red brown devitrified cxl and lithic bearing tuff. Clay and hematite alteration dominate the tuffaceous material; crystals are sparse, and consist of angular sub mm chips of feldspar and occasional euhedral magnetite cxls. Some occasional tuff fragments display a eutaxitic texture; some fragments show mylonitization.

50% White to very light green strongly metasomatized tuff. The texture is similar to the brown tuff, but has been strongly metasomatized w/ recrystallization of the finer materials. The rock has been altered to clay (illite?), albite, calcite, minor chlorite, magnetite, and specular hematite. Vein minerals include calcite, laumontite and minor chlorite.

6410-6420 a/a W/ some mylonite.

6420-6430 a/a W/ 65% white metasomatized tuff; 35% brown tuff.

6430-6440 a/a Cuttings much finer. 75% white to light green metasomatized tuff a/a; 25% brown tuff a/a.

6440-6450 a/a 50/50 split, brown/white tuff.

6450-6460 80% White to very light green strongly metasomatized tuff a/a. Original clastic texture is increasingly obscured. Secondary calcite, both disseminated and fracture filling, are abundant; zeolites are decreasing.

20% Brown tuff a/a.

6460-6470 Trip sample

60% Red brown to gray brown devitrified and locally quite compacted cxl and lithic bearing tuff.

40% White to very light green gray, strongly metasomatized tuff. The clastic texture is still quite visible. The rock is altered to white clay, albite, and calcite, w/ localized concentrations of cryptocxln SiO₂, chlorite, and tr. of Fe oxides.

6470-6480 a/a

6480-6490 a/a

6490-6500 80% White to very light green, strongly metasomatized, cxl-lithic tuff. Rock is locally recrystallized to albite, clay (illite?), calcite, cryptocxln SiO₂, local minor chlorite, and tr. pyrite. Some relict clastic texture remaining. Secondary zeolites occur in very minor amounts. Calcite occurs both as a secondary mineral in the rock, and as the major vein filling mineral. Cryptocxln SiO₂ and quartz occur as vein minerals.

6490-6500 (cont.)
20% Gray brown to red brown devitrified cxl and lithic bearing tuff as above. Note: occasional mylonitized fragments are present.

6500-6510 a/a W/ 2% uphole slough.

6510-6520 a/a W/ 50/50 split white altered tuff and brown tuff.

6520-6530 a/a

6530-6540 a/a Continued minor mylonite.

6540-6550 a/a 30/60 split brown tuff and white altered tuff.

6550-6560 a/a

6560-6570 a/a Trip sample, higher proportion of brown tuff and uphole debris.

6570-6580 80% White metasomatized tuff. Secondary pyrite is minor but becoming more abundant. Silicification is increasing; tr. of drusy quartz are present.
20% Brown tuff.

6580-6590 a/a W/ continued mylonite. The rock is increasingly hornfelsesed and is losing its relict clastic texture.

6590-6600 a/a W/ 40% brown tuff. Vein minerals include cryptocxln SiO₂, calcite, tr. pyrite, chlorite, and drusy quartz.

6600-6610 60% White to very light green hornfelsesed tuff. Rock has been metasomatized to cryptocxln SiO₂, albite, calcite, clay (?) with minor chlorite and pyrite. Vein fillings consist of cryptocxln SiO₂, quartz, calcite, minor chlorite (often associated w/ pyrite) and tr. drusy quartz. Little relict clastic texture remains.
40% Gray brown to red brown devitrified cemented cxl and lithic bearing tuff a/a.

6610-6620 a/a W/ 20% brown tuff.

6620-6630 a/a Minor shearing.

6630-6640 a/a W/ 95% hornfelsesed tuff.

6640-6650 No sample due to trip.

6650-6660 a/a

6660-6670 a/a 50/50 split brown cxl lithic tuff with altered white tuff, mylonite.

6670-6680	50%	Brown gray to red brown cxl lithic bearing devitrified tuff a/a; locally sheared.
	50%	White to very light green strongly metasomatized, locally hornfelsed tuff. Relict textures indicate similar material as the brown tuff. Rock is altered to cryptocxln SiO_2 , albite, calcite, illite (?), and minor chlorite. Vein minerals include cryptocxln SiO_2 , quartz, calcite w/ tr. pyrite, drusy quartz, and chlorite. Mylonite is common.
6680-6690	a/a	
6690-6700	95%	Metasomatized tuff, w/ amount of chlorite increasing. Some small pieces consist of an aggregate of chlorite, magnetite, and hematite.
	5%	Brown gray to red brown devitrified tuff.
6700-6710	a/a	
6710-6720	97%	White to very light green hornfelsed cxl lithic tuff. Rock is almost totally recrystalized with much metasomatism. Composition is mostly cryptocxln SiO_2 , albite, quartz, and illite (?). Chlorite is present locally in minor amounts; calcite has decreased to minor amounts. Only trace amounts of pyrite are observed. No drusy quartz observed.
	3%	Uphole slough, including brown cxl lithic tuff and micro-diorite intrusive fragments.
6720-6730	a/a	W/ tr. drusy quartz and possible laumontite.
6730-6740	a/a	W/ minor mylonite.
6740-6750	a/a	
6750-6760	a/a	W/ local light brown stain and minor mylonite.
6760-6770	a/a	
6770-6780	98%	White to very light brown to very light green hornfelsed tuff. Rock is totally recrystalized to a fine aggregate of SiO_2 , albite, illite (?), local concentrations of chlorite and tr. of disseminated pyrite. Other secondary minerals include small amounts of calcite, drusy quartz, and minor zeolites. 20% of the chips show a light Fe oxide stain. Minor amounts of mylonites are present.
	2%	Uphole slough (brown tuff).
6780-6790	a/a	

6790-6800 a/a W/ slight increase in chlorite content.

6800-6810 a/a W/ 8% sheared and brecciated brown tuff containing veins of calcite and laumontite.

6810-6820 98% White to very light green, locally very light brown, hornfelsed tuff. The tuff is fine crystalline, usually with no relict texture, consisting of cryptocxln SiO₂, albite, quartz, illite (?), minor chlorite and tr. pyrite. Vein minerals include cryptocxln SiO₂, quartz, minor calcite, and chlorite.
2% Uphole slough including brown cxxlithic tuff.

6820-6830 a/a One piece of chlorite-calcite-laumontite vein filling found. Chlorite susually is associated w/ SiO₂.

6830-6840 a/a

6840-6850 a/a Some pyrite appears slightly oxidized.

6850-6860 a/a W/ slight increase in pyrite.

6860-6870 a/a Secondary chlorite-quartz association is common, tr. laumontite present.

6870-6880 a/a W/ continued tr. mylonite.

6880-6890 a/a

6890-6900 95% White to very light green, locally very light brown hornfelsed tuff composed of fine cxln SiO₂, albite, illite, and chlorite. Vein minerals include quartz, chlorite, and tr. pyrite. Occasional fragments of pyrite have been oxidized.

6900-6910 a/a

6910-6920 a/a

6920-6930 a/a

6930-6940 98% Light brown white to light green white to white fine cxln hornfelsed tuff. Rock is composed of cryptocxln SiO₂, albite, and illite. Secondary chlorite occurs in minor amounts; secondary pyrite in trace amounts. The nearly pervasive brownish tint looks like Fe oxide. Local areas show red Fe oxide staining. Minor vein minerals consist of cryptocxln SiO₂, quartz, minor calcite, tr. laumontite and tr. chlorite. Mylonitized tuff fragments are common.
2% Uphole slough.

6940-6950	a/a	W/ increased mylonite.
6950-6960	95%	White to orange white, locally green white, pyrite bearing chlorite, albite grade hornfelsed tuff w/ remnant quartz cxls and secondary silica, calcite, and tr. laumontite.
	5%	Brown cxl bearing lithic tuff (slough from uphole).
6960-6970	a/a	W/ 10% gray green silica metasomatized micro-diorite.
6968-6969		Thin sill of green gray chloritized micro-diorite.
6970-6980	100%	White to light gray hornfelsed tuff w/ abundant cryptocxln silica, moderate amounts of calcite, clay (illite?), albite, tr. pyrite, chlorite, and laumontite.
6980-6990	a/a	
6990-7000	a/a	W/ abundant quartz veins.
7000-7010	a/a	W/ moderate amounts of orange brown Fe oxide staining.
7010-7020	a/a	Secondary pyrite tends to follow chlorite; also minor light orange brown fragments may contain some siderite.
7020-7030	a/a	Orange brown staining common; some amorphous blooms of orange brown mineral (Fe oxide and clay?) congenetic w/ late stage drusy quartz.
7030-7040	a/a	W/ slough from uphole (brown tuff).
7040-7050	a/a	Increased orange brown color, possibly both disseminated hematite and siderite; continued slough from uphole.
7050-7070		No sample recovered, trip for washout.
7070-7080	90%	White to light gray to brown gray hornfelsed tuff w/ secondary silica, quartz, calcite, illite, albite, moderate amounts of chlorite, tr. pyrite, tr. hematite, and tr. laumontite; also tr. mylonite.
	10%	Brown cxl and lithic bearing tuff, slough from uphole.
7080-7085		Torquing sample: Hornfelsed tuff here is very strongly silicified, much more so than above.
7085-7090	90%	Light gray to green white hornfelsed tuff, moderately silicified w/ secondary silica, quartz, calcite, chlorite, laumontite, and tr. pyrite; also tr. mylonite.
	10%	Slough from brown tuff uphole.

7090-7100	a/a	W/ minor secondary laumontite in hornfelsed tuff.
7100-7110	a/a	W/ 2% chloritized micro-diorite fragments, usually associated w/ fragments of hornfelsed tuff.
7110-7120	a/a	
7120-7130	60%	Light brown gray to light green gray hornfelsed tuff w/ local concentrations of disseminated laumontite. Relict texture of original tuff is more apparent than above. The degree of silicification is significantly less than above. Secondary minerals include calcite, albite, clay, silica, chlorite, and laumontite.
	30%	White to green to brown sheared hornfelsed tuff w/ associated vein calcite, laumontite, drusy quartz, silica, chlorite, clay (illite?), and hematite.
	10%	Slough from uphole brown tuffs.
7130-7140	a/a	W/ 70% sheared tuff; overall fragments showing a more micro-granular texture; secondary silica more localized as fracture or pocket fillings.
7140-7150	70%	Hornfelsed tuff a/a.
	20%	Gray to green gray to brown gray metasomatized andesite; color controlled by Fe oxidation state (chlorite or hematite).
	10%	Slough from brown tuff uphole.
7150-7160	a/a	W/ andesite up to 45% of cutting volume; some fragments w/ zeolite filling vesicles; some fragments suggest brecciation/auto-brecciation. Only tr. secondary calcite associated w/ andesite/diorite.
7160-7170	50%	Gray to green gray to brown gray metasomatized andesite, locally brecciated and cemented w/ silica. Secondary Fe minerals vary from chlorite to hematite. Rock appears to contain tr. primary quartz cxls, and abundant micro-recrystallized plag. (albite?).
	40%	White to light green to green gray hornfelsed tuff w/ secondary minerals continuing a/a.
	10%	Slough from brown tuff uphole.
7170-7180	a/a	W. tr. pyrite as vein mineral.
7180-7190	a/a	Andesite now 60% of sample volume, some fragments appear to be brecciated w/ tuff prior to metasomatic alteration.
7190-7200	a/a	

7200-7210	30%	Metasomatized andesite.
	60%	Metasomatized and hornfelsed tuff, often sheared and brecciated w/ silica, calcite, chlorite, hematite, and tr. laumontite. Much relict tuff texture evident in these fragments.
	10%	Slough from brown tuff uphole.
7210-7230		No samples recovered, tripping for washouts.
7230-7240		Green gray to red gray rexlized quartz bearing lithic tuff. Quartz fragments are the only remaining primary cxls. Secondary minerals include silica, chlorite, calcite, clay, albite, hematite, and tr. laumontite. Moderate shearing present.
7240-7250	a/a	
7250-7260	a/a	W/ tr. pyrite, tr. drusy quartz, and minor chloritized andesite.
7260-7270	a/a	Tr. pyrite associated w/ silica and chlorite, appears to precede hematite alteration.
7270-7280	a/a	W/ secondary laumontite, calcite, and chlorite occurring in veins.
7280-7290	90%	Green gray, w/lesser red gray, rexlized, quartz bearing lithic tuff, w/ well preserved relict texture a/a, secondary minerals a/a.
7290-7300	70%	Green gray, locally red gray, rexlized lithic tuff a/a.
	30%	Green gray chloritized aphanitic andesite w/ secondary chlorite, calcite, and laumontite as vein minerals.
7300-7310	95%	Rexlized tuff a/a.
	5%	Green gray diorite/andesite a/a.
7310-7320	25%	Green gray to red gray rexlized lithic tuff.
	75%	Green gray to gray aphanitic andesite w/ occasional chloritized mafic mineral sites and occasional euhedral quartz phenocrysts. The green gray portion is chloritized. Secondary calcite is common. Vein minerals continue a/a, w/ tr. pyrite.
7320-7330	15%	Rexlized lithic tuff.
	85%	Gray, locally green gray aphanatic andesite a/a, w/ occasional altered hornblende phenocrysts. Secondary minerals continue a/a.

7330-7340	10% 90%	Gray to green gray aphanitic andesite a/a. White to light green white hornfelsed tuff w/ occasional quartz fragments representing the only remaining relict mineral phase. Secondary minerals include silica, quartz, albite, clay, (illite?), chlorite, and tr. laumontite.
7340-7350	10% 90%	Gray to dark green gray andesite a/a. White to light green white hornfelsed tuff. Relict clastic texture occasionally visible as quartz cxl fragments with overgrowths. The rock is largely recrystallized to silica, quartz, albite, white to light blue-green clays, chlorite, tr. pyrite, and tr. laumontite. Very small (0.1 mm) spherical shapes of a white (clay?) mineral in the silicified hornfels are very common. Quartz veins occur throughout.
7350-7360	a/a	W/ approximately 5% andesite fragments.
7360-7370	98% 2%	White to very light green hornfelsed tuff a/a. Dark gray andesite a/a.
7370-7380	100%	White to very light green hornfelsed tuff w/ tr. specular hematite.
7380-7390	100%	Light green to white hornfelsed tuff. The textures are variable, w/ relic clastic texture still visible as remnant quartz grains and ghosts of lithic clasts. The rock has been largely recrystallized to silica, quartz, albite, and illite (?); w/ localized areas of chlorite often associated w/ minor calcite, tr. laumontite, pyrite, hematite, and specular hematite. Thin veins of cryptocrystalline SiO_2 are pervasive, and cavities with infillings of drusy quartz are common. Spherical shapes of a soft calcareous material with chlorite rich rinds are present in minor amounts.
7390-7400	a/a	
7400-7410	80% 20%	White to yellow-white to green-white hornfelsed tuff a/a. The rock has been strongly silicified, with fine veins of cryptocrystalline SiO_2 , calcite, chlorite, tr. pyrite, and tr. laumontite. Dark gray to green gray aphanitic andesite as seen at 7310-7350 ft. The green portion has been chloritized. Minute veins of cryptocrystalline SiO_2 and calcite are common, and chlorite less common.
7410-7420	60% 40%	Hornfelsed tuff. Dark gray to green gray andesite.

7420-7430	75%	Dark gray to dark green gray locally chloritized aphanitic andesite. Thin vein infillings of cryptocxln SiO_2 , calcite, minor chlorite, and tr. pyrite are common.
	25%	White to light yellow to light green hornfelsed tuff a/a.
7430-7440	95%	Dark gray to green gray andesite a/a, w/ occasionally more massive silica veins.
	5%	Hornfelsed tuff.
7440-7450	a/a	
7450-7460	100%	Dark gray to green gray aphanitic andesite. The greenish clasts are chloritized, and are usually calcareous. The rock is quite fine grained, and appears recrystallized, making mineral determinations difficult. Vein filling minerals are common, and include calcite, cryptocxln SiO_2 , quartz, minor chlorite, tr. pyrite, and tr. hematite.
7460-7470	a/a	
7470-7480	100%	Dark gray to green gray hornblende and plag. bearing aphanitic andesite. Local chloritization is often associated with fracture fillings. Very rarely remnant hornblende cxls are visible; clear plag. phenocrysts are somewhat more common. Secondary minerals include cryptocxln SiO_2 , calcite, laumontite, chlorite, pyrite (usually associated w/ chlorite), tr. magnetite, and hematite.
7480-7500	98%	Green gray to light gray andesite w/ increased veins and groundmass alteration. Secondary calcite is more abundant.
	2%	Gray to brown fine grained tuffaceous sediments w/ lighter colored fragments. The rock appears to be recrystallized w/ little to no remnant texture.
7500-7510	40%	Dark to light gray altered andesite a/a.
	60%	Light gray to gray recrystallized, locally silicified tuffaceous sediments; often w/ mottled white texture resulting from recrystallization. Secondary minerals include silica, w/ minor quartz and calcite in veins.
7510-7520	a/a	
7520-7530	15%	Dark to light gray altered andesite a/a.
	20%	Light gray to gray lithic rich volcanoclastic rich sediments w/ minor quartz grains. The particle size ranges from sand to silt.
	65%	Gray to light gray fine grained to cryptocxln tuffaceous sediments; predominately recrystallized. Secondary minerals include moderate calcite and localized cryptocxln silica.

7530-7540	95%	Gray to dark gray recrystallized silt to sand size volcaniclastic sediments w/ secondary calcite and local cryptocrystalline silica. The calcite is often associated w/ coarser sediments and the silica is limited to fracture fillings.
	5%	Gray to dark gray to green gray altered aphanitic andesite.
7540-7550	60%	Light to dark gray recrystallized, crystalline and lithic to cryptocrystalline volcaniclastic sediments a/a.
	40%	Light gray to green gray chloritized and silicified crystalline tuff, w/ euhedral quartz crystals up to 2% of volume. Chlorite is very localized and may represent former lithic sites. The white recrystallized groundmass contains micro-feldspar crystals, possibly albite.
7550-7560	15%	Light gray green to light gray fine grained to cryptocrystalline recrystallized tuffaceous sediments and tuffs.
	5%	Andesite slough from uphole.
	80%	Light gray green to gray to white quartz bearing meta-tuff or rhyolite flow. All mafic sites, and possibly lithic sites, have been chloritized. The white groundmass appears to have been albitized (poikiloblastic albite). Clear euhedral quartz crystals often contain white rounded inclusions and embayments. Minor secondary calcite occurs throughout the rock. The alteration appears to be isochemical.
7560-7570	a/a	
7570-7580	99%	Light green gray to white quartz bearing meta-tuff a/a, w/ minor veinlets of chlorite, calcite, silica, and zeolite (laumontite?).
7580-7587	a/a	
7587-7598		No samples recovered, washout.
7598-7610	20%	Slough from uphole; mainly red brown crystalline bearing lithic tuff and gray to gray green aphanitic andesite.
	80%	Light green gray to white quartz bearing meta-tuff a/a.
7610-7620	a/a	W/ 10% slough from uphole.
7620-7630	a/a	W/ tr. pyrite w/ co-genetic w/ quartz phenocrysts.
7630-7640	a/a	W/ 2% slough from uphole.
7640-7650	100%	Very light gray to light green gray chloritized and locally silicified quartz bearing meta-tuff. Secondary minerals include chlorite in what appears to be former mafic crystalline and lithic sites; poikiloblastic albite; cryptocrystalline silica; and tr. pyrite in healed fractures. Approximately 5% of rock consists of clear angular to subrounded crystalline fragments of quartz. All relict texture has been obliterated.

7650-7660	a/a	
7660-7670	a/a	
7670-7680	a/a	W/ increased silicification.
7680-7690	a/a	W. tr. secondary reddish hematite in microfractures.
7690-7700	a/a	
7700-7710	a/a	
7710-7720	a/a	
7720-7727	a/a	W/ 5% mixed slough from uphole.
7727-7734		No sample recovered, trip for washout.
7734-7740		Trip sample.
	10%	Uphole slough including dark to light green gray fine aphanitic intrusive.
	90%	White to light green gray silicified and locally chloritized meta-tuff. Chlorite occurs in shapeless pods and as pseudomorphs after femic cxls. 0.2 - 1.0 mm subhedral anhedral quartz cxls, often w/ overgrowths, compose 10-15% of rock. Matrix is mostly cryptocxln SiO ₂ , albite, minor clay, tr. calcite, tr. secondary pyrite, hematite, and an unidentified yellow brown clay.
7740-7755		No sample, washout.
7750-7760	10%	Uphole slough.
	90%	White to light green white meta-tuff a/a. Note: many of the larger quartz clasts have white inclusions.
7760-7770	5%	Uphole slough.
	95%	White to light green white silicified meta-tuff, as above, but with increased sub mm patches of light yellow to yellow green clay.
7770-7780	5%	Uphole slough; including reddish brown lithic tuff, and green gray fine grained andesite/microdiorite.
	95%	White to light green white silicified, locally chloritized, meta-tuff w/ relict primary quartz cxls. Most of the material has been rechlized to cryptocxln SiO ₂ , albite, quartz, and minor local chlorite (after mafic minerals and lithic clasts). Primary quartz cxls are 0.1 - 1.0 mm, white, and less common than quartz. Green to yellow clay occurs in local patches. Minor calcite and tr. pyrite are also present.

7780-7790	a/a	
7790-7800	a/a	
7800-7810	a/a	
7810-7820	a/a	W/ 1 - 2% uphole slough.
7820-7830	a/a	
7830-7840	a/a	
7840-7850	a/a	Relict pyrite is very sparse and badly oxidized.
7850-7860	a/a	W/ tr. laumontite and v. minor calcite in veins.
7860-7870	a/a	
7870-7880	a/a	
7880-7890	a/a	
7890-7900		No sample, tripped for bit change.
7900-7910	97%	White to very light green silicified and hornfelsed meta-tuff w/ varied intensity of chlorite-albite grade metamorphism. Relict anhedral to subhedral quartz cxls which have been embayed and contain rounded white inclusions compose up to 10% of the meta-tuff fragments. The ground-mass is cryptocxln and appears to be mainly silica. Secondary albite ranges from poikiloblastic to discrete anhedral cxls, varying w/ the degree of metamorphism. Secondary chlorite occurs as pseudomorphs in former femic mineral sites, in veins, and to a lesser extent as a disseminated mineral. Secondary calcite occurs in moderate amounts, often associated w/ chlorite. A minor amount of secondary pyrite is present, and often displays oxidized surfaces.
	2%	Slough from uphole.
7910-7920	a/a	
7920-7930	a/a	
7930-7940	a/a	
7940-7950	a/a	
7950-7960	a/a	W/ tr. laumontite associated w/ calcite and chlorite in veins.

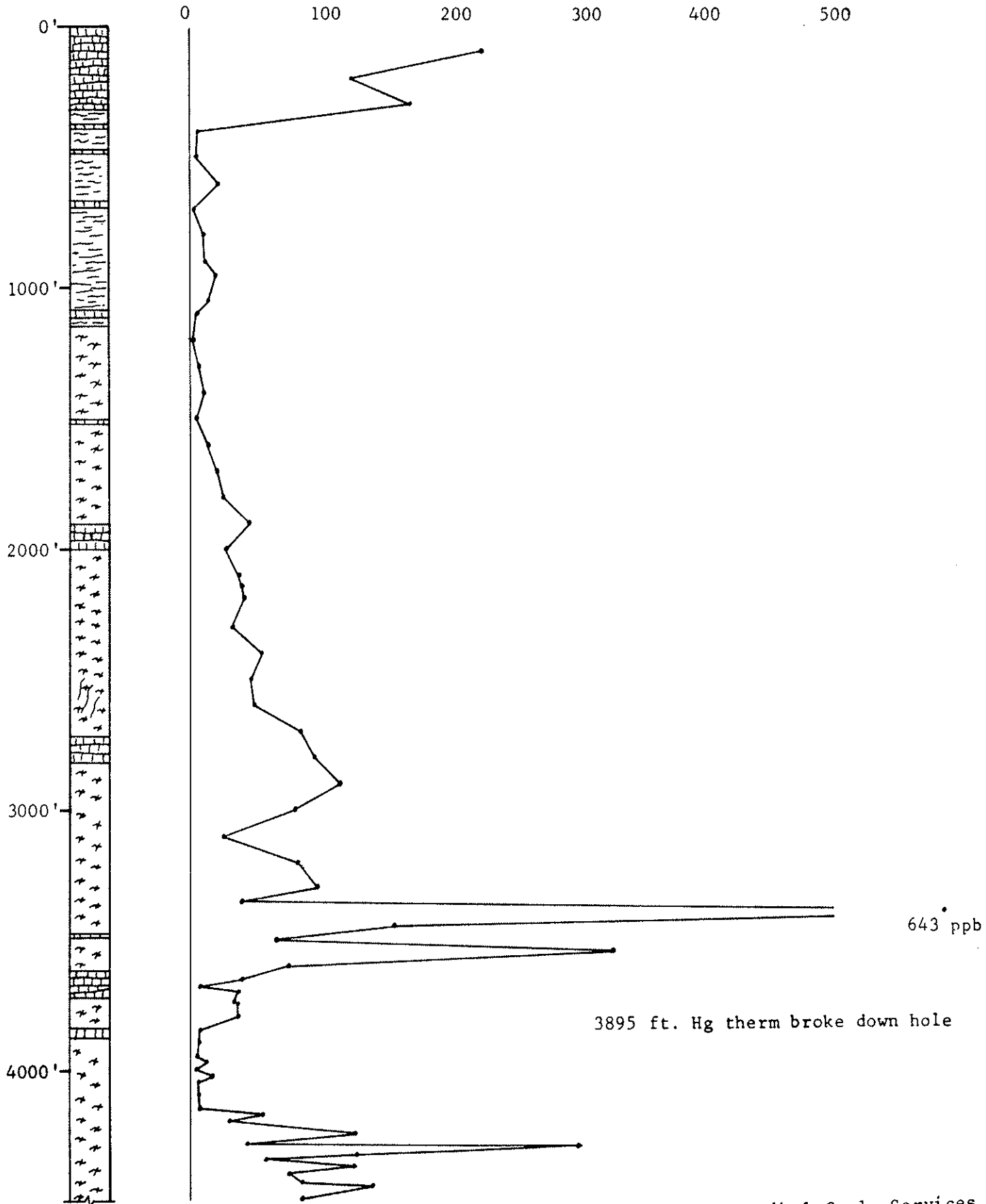
7960-7970	a/a	W/ laumontite.
7970-7980	a/a	
7980-7990	a/a	
7990-8000	a/a	
8000-8010	a/a	
8010-8020	a/a	
8020-8030	a/a	
8030-8040	a/a	
8040-8050	a/a	
8050-8060	a/a	

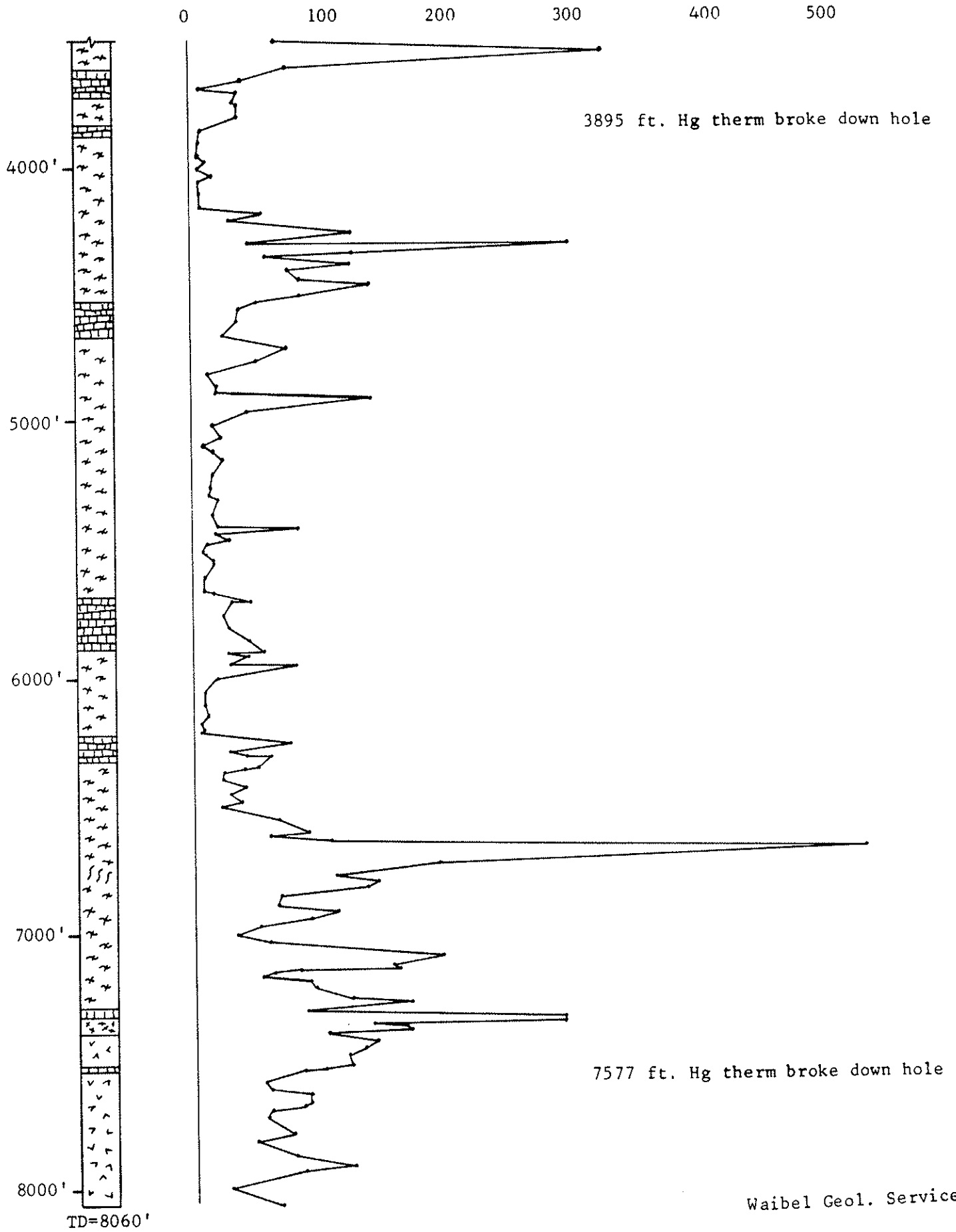
TD 8060 feet

Hg data (in ppb) - washed, air dried cutting samples

USA 58-28

Analyses by Baroid -- on site





MERCURY ANALYSES OF DRILL CUTTINGS

The samples were analysed by Baroid, using a Jerome gold film mercury detector.

<u>Sample</u> <u>Depth (ft)</u>	<u>Hg</u> <u>(PPB)</u>	<u>Sample</u> <u>Depth (ft)</u>	<u>HG</u> <u>(PPB)</u>
110	224	3700	37
200	125	3740	32
300	170	3750	36
400	5	3800	36
500	4	3850	8
600	21	3900	6
700	2	3950	6
800	10	3970	12
900	11	4000	5
950	19	4030	16
1050	13	4050	6
1100	5	4100	8
1200	2	4150	7
1300	7	4170	56
1400	10	4200	29
1500	3	4250	124
1600	13	4290	43
1700	20	4300	296
1800	25, 26	4330	128
1900	45	4350	57
2000	27, 26	4384	126
2100	37	4400	77
2200	43	4440	84
2300	32, 33	4450	139
2400	56	4500	85
2500	48	4520	50
2600	49	4550	37
2700	85	4600	33
2800	95	4650	25
2900	114	4700	77
3000	80	4750	50.2
3100	25	4780	25
3200	82	4800	11
3300	97	4850	19
3350	39	4860	19
3400	643	4900	140
3450	156	4950	42
3500	66	5000	15
3550	321	5050	21
3600	74	5080	9
3650	39	5100	15
3680	6	5136	23

Mercury Analyses of Drill Cuttings, (Cont.)

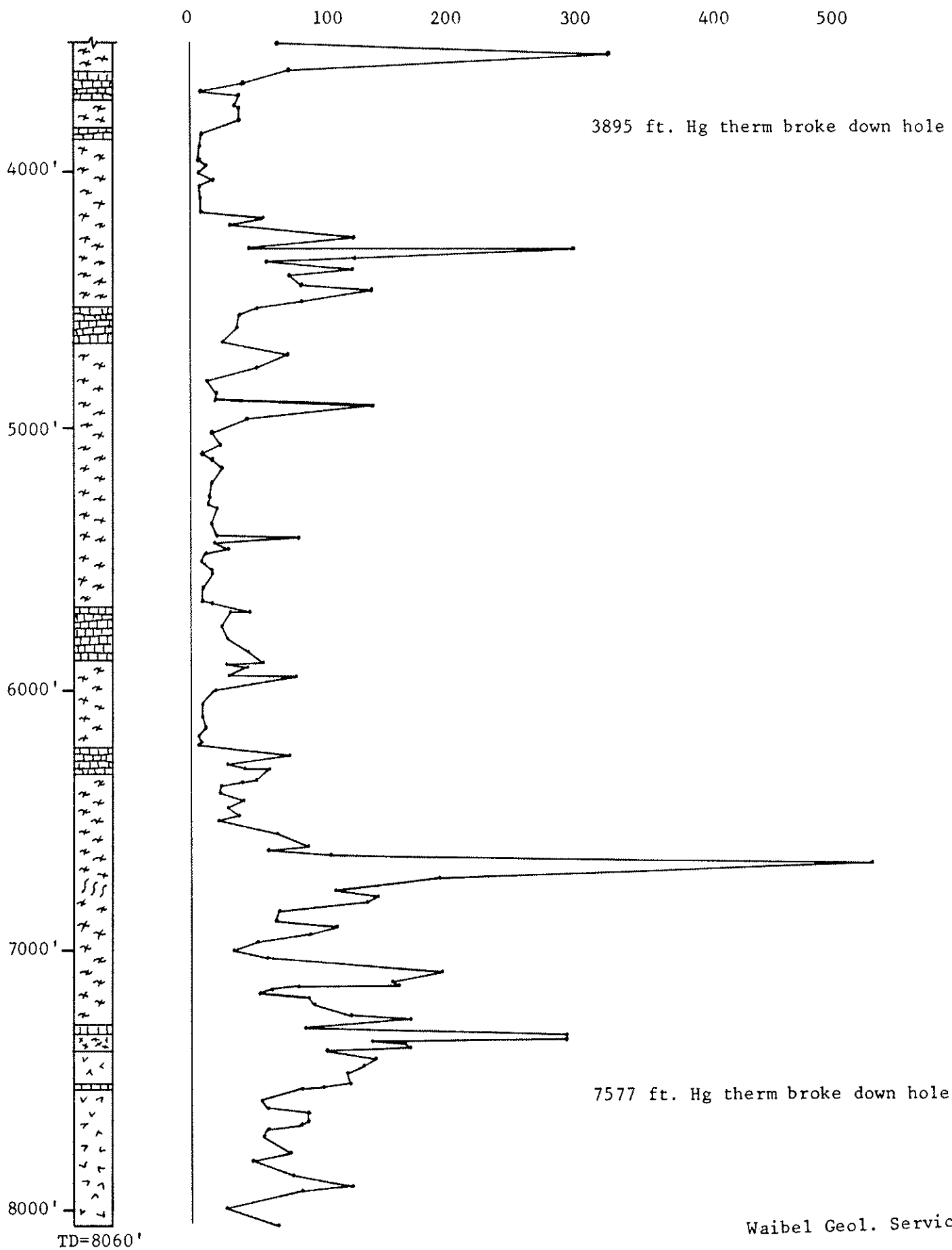
5250	12	6610	59
5280	11	6640	107
5300	20	6670	523
5350	15	6730	190
5400	19	6760	110
5410	82	6790	133
5420	18	6820	134
5450	29	6850	69
5470	11	6880	66
5500	9	6910	111
5540	17	6940	90
5550	17	6970	49
5600	10	7000	31
5650	9	7030	57
5660	15	7090	192
5690	45	7120	152
5700	30	7130	158
5750	22	7140	81
5800	28	7150	61
5850	43	7160	51
5890	57	7180	90
5900	27	7210	94
5910	43	7250	122
5940	29	7270	167
5950	80	7300	86
6000	19	7330	288
6050	9	7350	288
6065	7	7356	138
6100	9	7360	163
6150	10	7375	165
6173	5	7390	104
6200	7	7420	151
6210	5	7450	131
6250	76	7480	119
6280	27	7510	121
6287	41	7530	101
6290	63	7540	85
6300	55	7580	53
6340	49	7610	59
6350	39	7630	88
6360	23	7660	88
6390	22	7670	84
6420	40	7690	58
6450	29, 29	7720	44
6480	35, 34	7780	75
6500	20, 26	7810	46
6550	68, 81	7870	76
6600	90, 89	7910	122

Mercury Analyses of Drill Cuttings, (cont.)

7930	84
7990	26
8060	65

Standards

MCN	19
LP341	49
LP383	79



Analyses by Baroid -- on site

