**Fallon 88-24: 0-5020 ft**

\*\*Thin sections at ~100ft intervals

**0-100 ft:** No recovery

**110-130ft:** light gray, very fine grained ***lithic siltstone***. About 15-20% of fresh face is made up of dk mafic minerals, moderate breakage (doesn’t crumble), violent rxn w/ HCl – Carbonate cemented

**110ft:** piece with red orange, slightly translucent microcrystalline mineral, too small to scratch (thin platy mineral breaks when touched, not in matrix of silt stone so it wont stay in place when scratched), appears to have formed in a vn (0.1 mm)

**140-240 ft:** moderate gray silty ***qtz rich lithic sandstone***, carbonate cement (violent HCl rxn), larger clasts range from 0.1-1 mm, although grain size is consistent at each interval (variation between depths), 10-20% mica (bt+musc), 60-70% qtz (lt gray to clear); 10% black (hbl) mineral; 10-20% red orange mineral (Fe stained qtz?, clasts are mostly subrounded to sub angular cemented w/finer clay-silt material

**? 170ft:** Black mineral, soft, when smeared a submetallic red-orange almost copper colored color emerges about 0.5 mm wide in a 1 cm swath, largest pebble in container

**? Red-Orange mineral:** similar to 110 ft note (see above), but does not have platy shape of vn mineral, hard (>5.5) slightly translucent, no xtl form seen,

**230-240:** poorly cemented seds, found as unconsolidated sand, well consolidated pieces tend to have more fines

**250-320ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~15% musc, 10% black minerals, well cemented w/carbonate mostly silts, w/ ~10% sand sized clasts

**330-370ft:** fine to coarse grained, subrounded, ***lithic sandstone*** w/ ~45% qtz, 30% flds, 24% dk gray, red, and green mafic minerals, 1% bt and musc

**380-530 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~5% mica, 5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% fine sand sized clasts, the lower contact is gradational for ~20ft where amount of sand (10🡪75%) and grain size (fine to coarse) in silt matrix increases

**410ft:** White, hard (>5.5) mineral w/concoidal (? Round on the exposed surface convex in shape relative to the rock surface)…chalcedony

**540-750 ft:** subroaded med-coarse grained ***qtz rich lithic sandstone***, w/70% qtz, 20% flds, 9% brown-black and red mineral (pyx), 1% bt/musc, grain size is mostly consistent w/ mostly medium, some coarse and fines, at 700 and 730-740ft the amount of fines increases, but is not greater than the % of coarse

**740; 800ft:** 2x5 mm (much larger than any clast) red-orange mineral that is scratched by metal, translucent. Euhedral in shape, probably a secondary mineral. <1 mm thick vn?

**760-790 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~5% mica, 5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% fine sand sized clasts

**800-1020 ft:** fine to coarse grained, subrounded, ***lithic sandstone*** w/ ~60% qtz, 30% flds, 9% dk gray, red, and green mafic minerals, 1% bt and musc, silty matrix makes up about 30% of pebble on average

 **900-910ft:** coppery colored mystery mineral, trace amounts

**950-1020ft:** some pieces mottled w/ silty patches, possibly down hole contamination, but w/ 10-15% at several depths suggests these may be part of this unit, gradational contact

**1030-1110 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~1% mica, <5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% very fine to fine sand sized clasts

**1120-1350 ft:** medium to very coarse grained subrounded to rounded ***lithic sandstone***, w/~60% qtz, 30% flds, 9% dk gray, red, and green mafic minerals, 1% bt and musc, silty matrix makes up about 15-25% of pebble on average

**1190-1270 ft:** concentration of qtz decreases to ~45%, more dk gray/green fragments ~20-25%

**1360-1390 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~1% mica, <5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% very fine to fine sand sized clasts

**1400-1470 ft:** medium to very coarse grained subrounded to rounded ***lithic sandstone***, w/45% qtz, 30% flds, 24% dk gray, red, and green mafic minerals, 1% bt and musc, silty matrix makes up about 20% of pebble on average, gradational contact from1460-1470ft

**1480-1490 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~1% mica, <5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% very fine to fine sand sized clasts

**1500-1590 ft:** medium to very coarse grained subrounded to rounded ***lithic sandstone***, w/45% qtz, 30% flds, 24% dk gray, red, and green mafic minerals, 1% bt and musc, silty matrix makes up about 20% of pebble on average, gradational contact from1460-1470ft

**1590ft:** Calcite, light blue-white, matrix, about 0.5 mm patch of ‘pure’ cal with most matrix in pebble being a gray silty mix

**1600-1640 ft:** subrounded sandy ***lithic siltstone*** w/ mostly qtz/flds clasts, ~1% mica, <5% black minerals, well cemented w/carbonate mostly silts, w/ ~10% very fine to fine sand sized clasts

**1650-1670 ft:** medium to very coarse grained subrounded to rounded ***lithic sandstone***, w/45% qtz, 30% flds, 24% dk gray, red, and green mafic minerals, 1% bt and musc, silty matrix makes up about 20% of pebble on average, gradational contact from1460-1470ft

**\*\*330-370, 540-600, 640-720, 1120-1290, 1340-1350, 1650-1670:** poorly cemented seds, found as unconsolidated sand, whereas well consolidated pieces tend to have more fines

**\*\*780; 1020 -1090ft:** thin (<0.1mm thick) purple fibers, most likely a contamination (fibers from clothing, possibly a veg)

**1680-1830 ft:** light gray ***siltstone***, with carbonate cement (violent HCl rxn), mineral grains are too small to id,

**1840-2000 ft:** fine toj coarse rounded to subrounded grained med gray ***lithic sandstone***, 45% qtz, 25% flds, 15% lt blue opal w/ semi metallic patches, 10% red/black mineral, 5% bt, dk gray to black or red volcanic fragments/minerals are more abundant at 1950ft, some pebbles begin to occur (***pebble conglomerate***)

**1940ft:** ‘pure’ calcite found in matrix, lt blue-white, ~0.5 mm patch found w/ silty matrix in all other pieces

**1950-2000ft:** dark greenish-gray/black w/mottled maroon pebbles of volcanics (?) with euhedral calcite in vugs 10% of total chips are pebbles of this nature

**2010-2080 ft:** dk gray 1mm to 5mm pebbles, ***basalt flow***, fizzes w/ HCl (calcite cement, maybe secondary calcite), mostly dk gray pebbles, some lighter pebbles (5-25%) exist (possibly downhole contamination from lithic sandstone above)

**2020ft:** thin (0.1 mm) orpiment vn, bright yellow w/ some red spots (realgar), soft (<5.5), one piece found

**2070ft:** small patches of orange FeOx

**2090-2120 ft:** lt gray silty ***tuffaceous sandstone***, carbonate cemented very fine sands and silts, qtz, bt and flds clasts identifiable, grains are subrounded to subangular, dk red and black unidentifiable minerals clasts, small rusty orange patches seen as ~5% (FeOx?)

**2130-2160 ft:** lt pink ***limey sandstone***, very fine to fine clasts of qtz and k-spar as well as red-black pebble, black mineral cemented w/ carbonate,

**2150 ft: NO RECOVERY**, presumably the unit is the same

**2170-2180 ft:** lt-mod gray ***lithic sandstone***, fine qtz, black mineral, grayish-green mineral make up clasts w/ carbonate cement (lt HCl rxn),

**??2180 ft:** Mixture of rock types: red vuggy volcanic, black aphanitic volcanic, pink limey sandstone, lithic sandstone

**2190-2220 ft: NO RECOVERY**

**2230-2890 ft:** poorly to well consolidated gray ***tuffaceous sandstone***, mostly found as fine sands, when found as cemented pebbles there is a very light HCl rxn, qtz clasts>flds >greenish gray and pink fragments

 **2230-2380 ft:** poorly cemented fine sandstone

 **2350-2380 ft:** FeOx is most abundant (~15-20%) at these depths

 **2390-2410 ft:** moderately well cemented lithic sandstone

**2420-2640 ft:** well cemented

**2450-2660 ft:** FeOx spots, more abundant (15-20%), commonly w/ FeOx spots is a metallic silver mineral that reacts w/ HCl (Po?)🡪Drill Shavings

**2550 ft: NO RECOVERY**

**2650-2660 ft:** poorly cemented FeOx rich relatively coarse sandstone; coppery colored mineral (metal shavings?)

**2670-2890 ft:** well cemented FeOx poor sandstone

**2900-2930ft:** dk gray to lt brown ***basaltic andesite***, lt brown pieces have been altered by flooding silica, some pieces are brecciated (fault??)

**2940-2970ft:** light brown/green to dk gray **basaltic breccia/sandstone**, mix w/ small fragments of lithic sandstone (downhole contamination), dk gray volcanic shows an aphanitic groundmass w/ ~0.1 mm ‘porphyritic’ black mineral (only visible through scope), lt brown pieces (when dry) turn greenish gray w/ HCl (no fizz though)

 **2940ft:** qtz+Py vn

 **2950ft:** disseminated Py in matrix of sandstone

**2980- 3260ft:** dk gray to brown ***basalt***, few visible minerals, ones that are visible are black (<0.1mm) or a green-yellowish translucent mineral (olivine)

 **2970ft:** fine grained pyrite w/ qtz

**2980ft:** qtz(?)+cal vn/vug, broken piece attached to basalt and fizzes w/HCl, but not on all parts hence qtz portion, small (<1 mm) vn of py found in one chip, variably translucent clear-white layers, also a thin silvery piece found (sulfide? Asp?)

**2990ft:** aggregate of Py

**3000ft:** qtz found in 2mm thick piece, most likely from a vn, other silica from this depth is brown due to impurities

**3060ft:** 1-2% silica chips

**3110-3130ft:** 2-5% silica chips

**3070ft:** 5% of chips are greenish to tan tuff

**3180ft:** >50% of chips are lt brown lithic sandstone cemented w/carbonate, other chips are aphanitic volcanics (basalt?), nearby chips have <5% lithics, this could likely be downhole contamination

**3210ft:** acicular, pink to maroon crystals, scratched by pick not by fingernail (natrolite???), bright orange mineral (anthropogenic?), found as a flat piece (vn mineral?), xtls are very fine amorphous creating a massive occurrence. Coppery colored mineral disseminated in basalt chip, mashed w/ pick, hard to tell if it was breaking or being scratched, lt blue opal

**3270- 3540ft: *basaltic breccia/sandstone*** Some brown to gray volcanic chips w/translucent white xtls (plag) and lt brown yellow xtls (pyx? Olv?), ~50% brown carbonate cemented lithic fragments, some clear calcite crystals form in some,

**3350ft:** <0.5 mm thick Orp vn, bright yellow, waxy luster, scratched by pick

**3360-** **ft:** 1-2% silica chips

**3360ft:** aphanitic, tan chip of tuff w/ very fine grained acicular black minerals (pyx)

**3490ft:** teal-green chl, harder than pick w/ disseminated metallic brassy yellow sulfide (py?) that is very fine grained, no fizz w/HCl

**3500-3510ft:** light teal, chl disseminated in matrix of basalt breccia.

**3550-3580ft**: aphanitic black ***basalt*** w/ some plag rich pebbles (~80% plag) and some pebbles being dk gray pxy pebbles?, ~1-5% FeOx spots w/ associated Drill Shavings (digging w/ pick allows shavings to magnetically stick to pick), all pebbles are sand sized in chips

 **3570ft:** tr chl found as small teal fragment

 **3580ft:** purple fibers

**3590-3890 ft:** ***Basaltic breccia/sandstone***, lt brown w/ slight reddish tint carbonate cemented fragments of angular dk gray-green basaltic pieces w/<5% red angular fragments, ~5% are FeOx spots (Po, <1mm filings attach to pick, magnetic?), <1% silica chips unless otherwise noted

 **3610-3620; 3710-3760ft:** chl ~1% of chips are colored teal

 **3630-3670ft:** 1-2% silica in chips

**3740ft:** lt yellow-greenish mineral lining vugs (<0.1mm diameter), too small to scratch, some have reddish mineral forming a very thin film between vug wall and yellow-green mineral

**3810ft:** lt blue-white silica chips (1%), microcrystalline

**3820-3850ft:** calcite chips form 1-3%, some are ‘pure’ calcite as 1mm chips, other chunks have cemented clasts in a matrix dominated 2-5 mm pebble. Few pebbles are clast dominated cemented w/ calcite

**3900-3930ft: *basaltic-andesite***, dk gray w/ ~2% calcite chips, 1% chl overprinted pebbles, 1% FeOx from Drill Shavings (found as small flakes that are magnetic sticking to pick), <1% silica chips clear to tan microcrystalline, some pebbles are carbonate cemented (downhole contamination),

**3940ft:** Reddish brown carbonate cemented ***lithic sandstone* (??)** clasts are dk gray basalt pieces and the matrix is a reddish (oxidized) color. Drill Shavings found and a white piece w/ specks of black minerals and micas.

**3950- 4170ft:** gray ***basalt*** fragments w/ some (<20%) pebbles of carbonate cemented basaltic fragments, few grains are a maroon red (similar to 3940ft unit, 2%) FeOx spots associated w/ Drill shavings (1%), green-teal chl overprinted grains (<1%)

**3980ft:** ~5% of chips are white, most (3-4% of total chips) are from qtz vnlts, very thin, often just a thin coating on a surface, some are actually cutting basalt, some white pieces (1-2% of total chips) are calcite cemented fragments (brecciated), maroon-red grains increase to ~5% at this interval

**4090ft:** fine grained gray-green speckled w/ tiny black mineral (tuff ?), no fizz (green color became prominent after HCl test), scratched with pick, one pebble found in chips

**4120-4170ft:** ~5% of basalt pieces have vugs w/ a thin layer of pink microcrystalline mineral (harder than metal) lining the vug wall

**4180- 4200ft:** Reddish brown carbonate cemented ***lithic sandstone* (??)** clasts are dk gray basalt pieces and the matrix is a reddish (oxidized) color, <1% of chips are clear to white qtz

 **4200ft:** <<1% of grains in chips are chl,

**4210-4220ft:** gray-brown ***basalt breccia/sandstone***, cemented w/ calcite, 1% of chips are silica (in 4220ft), most clasts are gray, few are red

**4230ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, 1% silica chips, tr Chl

**4240-4250ft:** gray-brown ***basalt breccia/sandstone***, well cemented w/ calcite, tr Chl, <1% silica chips,

**4260-4290ft:** dk gray ***basaltic andesite***, some chips are red (oxidized) pieces, , 2% silica chips (most are purely qtz, others are a thin qtz film on basalt)

**4300-4310ft:** gray-brown ***basalt breccia/sandstone***, cemented w/ calcite, 1% of chips are silica (in 4220ft), most clasts are gray, few are red

**4320ft:** ~50% of chips are microcrystalline, dk gray ***basalt*** (visible olivine) similar to 4330ft, some have vugs w/ calcite. ~30% are aphantic tan ***tuff*** w/ very fine black minerals speckled throughout, ~20% are a lithic (most fragments are a dk gray basaltic lithic, some are maroon grains) sandstone cemented w/ carbonate, of these sandstone pieces some are flooded w/ silica (lt blue-white--opal), Thin film of Py on Tuff

**4330ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, 1% silica chips, tr Chl

**4340ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular. One 2 mm chip of pure qtz, other small chips have qtz fragments w/ tr calcite (fizzes w/HCl) cementing fragments together

**4350-4370ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, 1% silica chips, tr Chl

**4380-4630ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular

 **4400-4480ft:** <1-2% silica chips

**4530ft:** 1% silica chips, also several tuff fragments, tr Po, some fragments of basalt are maroon-red (oxidized groundmass with very fine grained pyx xtls) w/ subhedral calcite filling void spaces, thin platy rust covered mineral (from vn?) w/ a black fresh face, sticks to pick (magnetic🡪 magnetite? Po?)

**4580ft:** ~5% of chips are a maroon red

**4590ft:** <1% FeOx spots, w/ some of the lithic fragments having chl overprint

**4600ft:** 1% silica chips

**4640-4670ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, <1% qtz chips, one tan tuff pebble found in 4670ft

**4680-4720ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular

 **4690ft:** Tr Chl

**4730ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, <1% qtz chips,

**4740-4760ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular

 **4760ft:** few pieces of vuggy basalt w/ thin film of calcite on top of a thin band of red (possibly oxidized wall rock) on vug wall

**4770-4780ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, 1% silica chips, two tan tuff pebble found in 4770ft

**4790- 4800ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular.

**4810-4860ft:** gray plag rich ***basaltic andesite***, w/ very few silica chips (<<1%), some basalt fragments have red spots (oxidation?)

**4860ft:** lt gray-tan soft fragment of tuff (?) w/ few black specks throughout the 1 cm chip, one other similar piece found in chips

**4870ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular. FeOx spots (1%; Drill shavings)

**4880-4920ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, very few qtz chips (1-5 small chips per interval), 10-15% of chips are sandstone (likely downhole contamination or interlayered)

 **4890ft:** reddish orange translucent, acicular mineral, scratched by metal

**4930-4970ft:** tan-gray ***basalt breccia/sandstone*** w/ dk gray basaltic fragments cemented w/ carbonate, fragments are subangular to angular

**4950ft:** 0.5% silica chips, some found cemented to pebbles other are chips unattached to anything

**4980-5020 ft:** dk gray w/ a slight brownish tint ***basaltic andesite***, 5-10% of chips are maroon (oxidation), 10-15% of chips are sandstone (likely downhole contamination), 1% clear to very lt gray qtz

**4990ft:** platy aggregate of euhedral qtz xtls, clear w/ Py on one side of the plate (small piece of basalt still attached, looks like Py was closest to vug wall

**END HOLE**

Uphole

Downhole

**Figure caption:** Measuring fracture/ bedding: Always measure from the right side where the rock makes an acute angle. Whenever possible, measure the red face. A 0˚ angle (purple) is horizontal, core is oriented at 90˚ fracture angle is between that. If two features exist and the second measurement should be the downhole angle measured (blue), include rotation angle where strike of first feature is 0˚, opposite dipping feature is 180˚. For example the figure shows fracture 1 (red) at 30˚ and fracture 2 at 60˚ rotated 0˚

30˚

60˚

**FOH-2: 0-4480 ft**

\*\*Cuttings 20 ft intervals

**0-560 ft:** gray fine to very coarse subangular ***qtz-rich lithic sandstone***, ~80% qtz and ~20% other lithic fragments that are red, black, and green and includes micas (~3% of total composition), carbonate cemented (often unconsolidated grains, but some depths, especially fine dominated layers, are found as 1-2 cm pebbles), mostly even distribution of grain size unless otherwise noted

**40-80 ft:**  fine grained dominated, consolidated ~85% fine grain matrix w/ 15% coarse clasts

**100-140 ft:** very coarse grains and pebbles, conglomerate but similar composition

 **220 ft:** No sample

**340-360 ft:** fine grained dominated, consolidated ~85% fine grain matrix w/ 15% coarse clasts

**420-560:** fine grained dominated, consolidated ~85% fine grain matrix w/ 15% coarse clasts

**580- 920ft:** fine to coarse grained subangular to subrounded ***tuffaceous/lithic sandstone***, ~50-60% qtz 20-25% green-dk gray mineral remainder is tuffaceous material (very fine grained), carbonate cemented, variable amounts of tuffaceous material mixed with lithics suggests possibly interlayered in <20ft increments?

**640; 740 ft:** tr Py

**940-1000 ft:** fine to coarse-grained subangular ***lithic sandstone***, mostly qtz and some plag, ~20-30% are dk gray/green/red lithic fragments, carbonate cemented

**980-1000 ft:** silicified area of sandstone, some carbonate on surface, <10% of pebbles are tuffaceous

**1020 ft:** fine to coarse grained subangular to subrounded ***tuffaceous/lithic sandstone***, ~50-60% qtz 20-25% green-dk gray mineral remainder is tuffaceous material (very fine grained), carbonate cemented

**1040-1120 ft:** very fine grained ***tuffaceous siltstone***, very few fines (bt found as well as other small lithics), mostly clay-silt sized particles (sticks to tongue)

**1140-1240 ft:** fine to coarse-grained subangular ***lithic sandstone***, mostly qtz and some plag, ~20-30% are dk gray/green/red lithic fragments, carbonate cemented

**1260-1280 ft:** fine to coarse grained subangular to subrounded ***tuffaceous/lithic sandstone***, ~50-60% qtz 20-25% green-dk gray mineral remainder is tuffaceous material (very fine grained), carbonate cemented

**1300-1620 ft:** very fine to medium grained, subangular to subrounded ***reworked tuff***, most pieces are a pastel green/red/buff/gray in color and are well cemented very fine grained, some pieces are medium grained dk gray lithic fragments cemented by carbonate, tr disseminated py found throughout this unit, some pieces have euhedral pyx in silica cemented mass of lithic fragments

**1640 ft:** fine to coarse grained subangular to subrounded ***tuffaceous/lithic sandstone***, ~50-60% qtz 20-25% green-dk gray mineral remainder is tuffaceous material (very fine grained), carbonate cemented

**1660-2000 ft:** very fine to medium grained, subangular to subrounded ***reworked tuff***, most pieces are a pastel green/red/buff/gray in color (tuff) and are well cemented very fine grained, some pieces are medium grained dk gray lithic fragments cemented by carbonate, some pieces have euhedral pyx in silica cemented mass of lithic fragments

**1660 ft:** No Sample

**1820 ft:** tr Py

**1860 ft:** No Sample

**1920-1940 ft:** qtz rich upper medium grained sandstone, possibly a different unit, but presence of some tuffaceous pieces and surrounding lithology makes it unlikely

\*\*Core in every 5th box

**2041-2042 ft:** lt gray fine to medium subrounded to rounded grained ***qtz rich lithic sandstone***, some 1-2 mm thick patches of black make up 1% matrix, cemented by carbonate

**2043-2049 ft:** mod gray ***lithic siltstone***, w/ some fine qtz sands and ~5% of <1 mm black specs of coal? (>5% of black specs at 2044’ for ~10cm and 2048’ for ~5 cm), few slightly sandy lenses, tr micas

**2044 ft:** slicks, deformation where black spots are in a wavy foliation (slightly S-curve)

**2045.5-2047; 2047.5-2049 ft:** intensely fractured rock, one section at 2049 is a nearly vertical fracture coated w/ a thin black film w/ slicks

**2050-2085 ft:**

**2086-2101 ft:** fine to coarse grained ***tuffaceous sandstone***, w/ clasts of qtz, flds and volcanic tuff, mostly medium clasts supported by a carbonate matrix, some lenses of fines exist (0.5-1.5 cm thick)

 **2086-2097:** poor recover, 0.63 total

 **2086-2087 ft:** clasts are very coarse

 **2087ft:** bedding measurement 27˚

**2087.5; 2095:** dk black, opaque dull lustered mineral softer than a fingernail (coal?) that make ~1 mm thick beds

**2087.5;2089; 2090; 2091; 2095; 2097:** fracture at 45˚ orientation w/ slicks roughly perpendicular to strike

**2088-2090:** 3-4 alteration spots/ft where center is a white calcite (0.5-1 cm thick), a rusty orange FeOx ring (<0.5 cm)and a black MnOx ring (<0.5 cm)

**2102-2138 ft:**

**2139-2145 ft:** gray very fine to coarse rounded to subrounded grained ***tuffaceous sandstone***, clast dominated consisting of qtz, flds, dk gray mineral, and a reddish/maroon mineral in a carbonate matrix, clast size varies on a 10s cm scale, bedding at 31˚

**2139-2140.5 ft:** 1 mm thick layer of black mineral (softer than pick) parallel to bedding (and fractured pieces), 10-20 occurrences

**2141 ft:** fracture at 25˚ w/ slicks, slicks are roughly perpendicular to strike of bedding, chl patch 1x4 cm area w/ a black halo surrounding it ~1 cm away w/ a thin rusty halo juxtaposed

 **2039-2043:** extra core recovered, 1.75 total, few fractured pieces

**2146-2182 ft:**

**2183-2193 ft:** medium-dk gray very fine to medium rounded to subrounded grained ***tuffaceous sandstone***, clasts consisting of qtz, flds, dk gray mineral, and a reddish/maroon mineral in a carbonate matrix, fractures occur at 3-10 cm intervals w/ clay layer on surface when slicks are not present, 1-2% of layers are black soft mineral (?), bedding at 23˚

 **2184 ft:** intensely fractured w/ slicks on a nearly vertical fracture face

 **2185 ft:** slicks

**2186 ft:** alteration patch w/ lt yellow-green chl in center, w/ orange and black halo surrounding

**2190-2192 ft:** fractured w/ some rusty alteration spots

**2192.5- ft:** intensely fractured many pieces are a fine grained siltstone, contact(?), fractured pieces are the last 6” of this box

**2194-2221 ft:**

**2222-2223 ft:** brownish gray fine grained ***siltstone***, surface has a sheen on most pieces, moderate to intensely fractured, likely contact metamorphism from underlying basalt, disseminated Py

**2223-2232 ft:** aphanitic vesicular ***basaltic andesite***, microcrystalline plag laths (only visible in 20x hand lens) are the largest crystals in a matrix of unidentifiable grains, vesicles make up about 15%, many vugs are filled w/ calcite and/or silica

**2223 ft:** fracture at 67˚sealed w/ qtz, locally vugs near fracture are also filled w/ qtz

**2225 ft:** fracture at 72˚ sealed w/ qtz, locally vugs near fracture are also filled w/ qtz

 **2227 ft:** fractures at 55˚, w/ no secondary minerals

**2233-2280 ft:**

**2281-2293 ft:** aphanitic gray ***basaltic andesite*** w/ 2-3 mm fractures sealed w/ qtz

 **2283-2293 ft:** Core loss .8 total

**2281-2283 ft:** vesicular basalt, vesicles make up <10% of rock, many are not completely seal, but have a 1-2 mm thick layer of crystalline qtz, few fractures in this depth are coated w/ py and clay

**2283 ft:** intensely fractured

**2288 ft:** fractures at 55˚ w/ white anhedral qtz on fracture surface

**2292 ft:** several fractures w/ white anhedral drusey qtz on fracture surface

**2294-2333 ft:**

**2334-2343 ft:** gray aphanitic vesicular ***basaltic andesite***, xtls are too fine grained to be identified

**2334-2337 ft:** vesicle rich basalt w/ ~20-25% of rock made up of vesicles, most w/ only a thin film of qtz and clay (drill mud?)

**2337-2343 ft:** vesicular basalt that is intensely fractured w/ 1-2 mm thick white qtz on most fracture surfaces, one occurrence of a lt blue opal, vugs are mostly filled w/ chl and cal

**2340 ft:** nearly vertical qtz filled fracture

**2342 ft:** several fractures at 65˚ w/ lt blue opal on fracture surface, portions near larger fractures are brecciated.

**2344-2391 ft:**

**2392-2402 ft:** gray to dk gray aphanitic vesicular ***basaltic andestite***, vesicles make up about 10-15% of rock and often have a thin film of silica and/or layers dk gray and brown mineral, some vugs are completely filled w/ white calcite

**2392 ft:** 2 mm cal vnlt at 75˚, a second fracture that only cuts one one side of the fracture w/ a thin veneer of Py

**2397-2398 ft:** moderately fractured basalt w/ a thin (<1mm) film of lt blue to white silica

**2401 ft:** fracture at 50˚ w/ thin silica film

**2403-2452 ft:**

**2453-2463 ft:** dk gray aphanitic vesicular ***basaltic andestite***, vesicles make up about 15% of rock and often have a thin film of silica and/or layers dk gray and brown mineral, few vugs are completely sealed by secondary minerals, moderately fractured through out section unless otherwise noted

**2454 ft:** Tr Chl seen as teal spots w/ near by fractures that have ~1 mm thick drusey microcrystalline qtz

**2460 ft:** Intensely fractured zone (~6”) w/ <1mm thick film of gray silica, at the top of the fractured zone a yellowish green mineral softer than pick (prehnite?)

**2462 ft:** two vugs are filled w/ white/yellowish green mineral(s) (prehnite) w/ near by tr teal chl (unassociated to prehnite)

**2464-2504**

**2505-2513 ft:** gray to dk gray w/ mottled red patches (2509 ft) aphanitic ***basaltic andesite***, <5% vesicles commonly filled w/ calcite and/or chl, microcrystalline plag lathes are the only mineral visible in the groundmass

**2505 ft:** intensely fractured for 6”+ starting at the beginning of the box (fractured zone could extend uphole), nearby fractures just down hole from most fractured portion at 82˚, no secondary minerals

**2507-2508 ft:** moderately fractured zone, one fracture at 30˚ has gray soft clay scale, another set of fractures is sealed w/ calcite ~1 mm thick along fracture surface and filling vugs nearby

**2508 ft:** 4” intensely fractured zone

**2513 ft:** 3.5” intensely fractured zone w/ thin amounts of silica and chl film on several pieces

**2514-2552 ft:**

**2553-2563 ft:** gray aphanitic vesicular ***basaltic andesite***, vesicle decrease in concentration below 2557’, about 5% of vesicles in vesicle rich portion are filled w/ calcite, most all vesicles in vesicle poor section are filled w/ calcite, moderately fractured throughout (some are likely related to drilling)

 **2560 ft:** ~4 mm thick cal vn and splay, w/ nearby vugs filled w/ calcite

**2561 ft:** ~0.5 cm thick cal+qtz vn (mostly qtz) at 35˚

**2562 ft:** brecciated calcite sealed zone ~3 cm thick, one side of zone is oriented at 75˚ w/ no brecciatation uphole of this feature.

**2564-2596 ft:**

**2597-2609 ft:** aphanitic gray vesicular ***basaltic andesite***, about 25% of groundmass are microcrystalline plag lathes, slightly altered w/ a teal chl overprint (intense at 2598, 2600, 2607 ft otherwise occurs in trace amounts), unless otherwise noted calcite occurs as <1% filling vesicles and veins

**2597-2607 ft:** core loss, 0.75 total

**2600-2607 ft:** calcite sealed veins (<0.5 cm thick) and vugs, intense chl above and below calcite filled area, at 2602 ft calcite cementing a brecciated area (~2 cm) of basalt

**2597 ft:** intensely fractured zone ~5 cm thick, no distinct fracture surface seen

**2610-2647 ft:**

**2648-2657 ft:** gray aphanitic ***basalt***, xtls are mostly too small to identify other than few plag lathes and patches of greenish yellow-brown mineral (olivine), vesicles occur <1% (except from 2648-2649 ft where they make up ~10%), tr chl exisits mostly near vugs, vugs are commonly sealed w/ a layer of dk gray mineral w/ calcite filling the remaining void space

**2648 ft:** brecciated zone (4+ cm, may continue uphole in previous box), most wall rock is brown from alteration, sealed w/ calcite

**2648.5 ft:**  fracture w/ thin film of dk gray + chl at 65˚, second fracture rotated 0˚ at 27˚, coated thin silica (gray blue in color microcrystalline w/ tr cal xtls on silica

**2051 ft:** ~10 cm intensely fractured zone w/ ~3 mm thick cal vn cut by ~1 mm thick vn w/ brown mineral (softer than pick, harder than finger nail, striations)

**2052 ft:** 2 cm thick cal sealed brecciated section, bottom of fractured zone at 50˚, downhole a 2 mm thick cal vnlt rotated 90˚ is at 43˚

**2053-2057 ft:** moderately fractured zone, very thin film of silica commonly found on fracture surfaces

**2658-2693 ft:**

**2694-2704 ft:** lt to med gray mottled reddish brown aphanitic ***altered basaltic andesite***, moderately to intensely fractured w/ thin silica (drusey qtz) forming on fracture surfaces, sometimes silica seals a brecciated zone, although silica is never thicker than 0.5mm, crumbly natures suggests microfractures, this may be a good area for a thin section

**2705-2729 ft:**

**2730-2740 ft:** aphanitic gray ***basaltic andesite***, anhedral plag is only visible mineral in ground mass, few small vesicles exist (<1%), fractures throughout this section are coated in thin grayish silica, no vn <0.5 mm, moderately fractured unless otherwise noted

**2730-2733 ft:** intensely fractured zone, portion of up hole most rock piece is brecciated sealed w/ a brown mineral (softer than pick, slight sheen), many pieces have a thin silica film ranging from white to lt blue-gray color

**2734 ft:** 3 cm zone of intensely fractured silica covered basalt

**2736 ft:** fractures at 27˚ and off 45˚ rotation a second dh fracture at 45˚

**2738.5-2740 ft:** intensely fractured zone w/ thin silica film on surfaces

**2741-2787 ft:**

**2788-2797 ft:** \*\*dropped box, rocks are mixed up, but same rock unit throughout\*\* aphanitic gray ***basaltic andesite***, moderately fractured (most commonly at ~55˚ w/ ~1-2 frac/ft, covered w/ thin amounts of cal+brown minerals, softer than pick, slight sheen, waxy feel) w/ few small vesicles mostly seen as small pock marks (<1 mm), one ~1 cm thick cal vn exisits (although no precise depth could be located due to mixed box)

**2798-2833 ft:**

**2834-2838 ft:** aphanitic gray ***basaltic andestite***, moderately fractured unless otherwise noted commonly w/ ~1 mm thick brown mineral and/or cal and tr chl, very few small pock mark vesicles

**2835 ft:** vn w/ brown mineral and later forming calcite (some brown mineral inclusions in cal as well as a thin layer preceding calcite growth), pinches and swells from 2 mm to 1 cm, at ~30˚

**2836 ft:** intensely fractured zone, uphole portion is brecciated w/ a cal seal

**2837.5 ft:** 15cm thick zone of brecciated basalt sealed w/ thin brown mineral, ~1% teal chl overprint

**2839-2842 ft:** heavily altered dk gray mottled w/ reddish brown patches ***basalt breccia/sandstone***, mostly altered to clay, some larger basalt pieces seem to be held together in a conglomerate, most clay has some carbonate aspect to it (fizzes w/ HCl), few occurrences of anhedral calcite (~1%) found as groundmass, intese fracturing at uphole most portion

**2841 ft:** maroon colored basalt w/ ~4 cm thick zone where silica lines small vug walls, down hole from this location more silica occurs (~1% of total rock through section) w/ mottled maroon patches

**2843-2879 ft:**

**2880-2886:** aphanitic gray ***basaltic andestite***, moderately fractured (most at ~45˚) unless otherwise noted commonly w/ ~1 mm thick brown mineral, qtz and/or cal and tr chl, very few small pock mark vesicles

**2886 ft:** 4 cm zone of intensely fractured basalt directly above the contact w/ basalt altered to clay

**2887-2890 ft:** heavily altered dk gray mottled w/ reddish brown patches ***basalt breccia/sandstone***, some clay alteration (?), some larger basalt pieces (subangular to subrounded) seem to be held together in a conglomerate, most clay has some carbonate aspect to it (fizzes w/ HCl), few occurrences of anhedral calcite (~1%) found as groundmass, tr chl, good spot for a thin section

 **2890 ft:** ~5cm zone of intensely altered zone

**2891-2929 ft:**

**2930-2040 ft:** brownish gray subangular to subrounded ***basaltic breccia***, some more clay rich areas have slight fizz w/ HCl, basalt clasts have small vesicles, mottled w/ patches of reddish brown, calcite veins (~1/ft) range from ~1 mm to 1.5 cm

**2931 ft:** 1.5 cm thick qtz+cal vn at 75˚ appears to be completely sealed although its broken across the vn in several spots (possibly mechanical fracture from drilling), similar albeit thinner (~0.5 cm) at 2936 ft

**2941-2975 ft:**

**2976-2985 ft:** gray to dk gray vesicular aphanitic ***basaltic andesite***, most small vesicles are filled w/ a dk brown to gray mineral, larger vesicles (mostly from 2981-2985 ft) are filled w/ calcite, few <1 mm thick vnlts are filled w/ a white mineral (softer than pick, no fizz, zeolite?)

 **2982 ft:** About 15 cm of basalt breccia w/ brown mineral cementing ~1-2 cm thick clasts

 **2983 ft:** Intensely fractured zone ~7 cm thick

**2986-3022 ft:**

**3023-3032 ft:** gray aphanitic  ***basaltic andesite***, no vesicles, few microcrystalline plag lathes, euhedral calcite vns are common (~1/ft)

**3024-2025 ft:** large calcite vn with surrounding rock brecciated and sealed by calcite, some void spaces remain, fracture near the top of brecciated zone is at 55˚

**3028 ft:** calcite vn ~0.5 cm w/ some entrained pieces of wall rock in portions, at ~60˚

**3033-3067 ft:**

**3068-3070 ft:** gray aphanitic ***basaltic andesite***, few vesicles mostly existing mostly as small pockmarks, few microcrystalline plag lathes, tr chl overprinting groundmass

 **3069-3070 ft:** intensely fractured zone about 1 ft thick

**3070-3073 ft:** subangular gray to dk gray ***basaltic breccia***, clasts up to 4 cm thick basalt w/ vesicles cemented w/ carbonate (weak fizz w/ HCl), extra core (1.2 total expected from 3068-3073)

**3071.5-3073 ft:** intensely altered area, chl overeprints most rocks at top of zone, bottom of zone is a browning-red zone, rare calcite vn and thin silica film on some irregular fracture surfaces

**3074-3075 ft:** gray to reddish brown aphanitic ***basaltic andesite***, few vesicles mostly existing mostly as small pockmarks, few microcrystalline plag lathes, tr chl overprinting groundmass, one larger vesicle is filled w/ calcite

**3076-3107 ft:**

**3108-3117 ft:** gray subrounded to subangular ***basaltic breccia/sandstone***, clasts range from coarse sand to pebble sized and vary at 10s of cm scale, weak HCl fizz in matrix (calcite cement?), basalt clasts are dk black to maroon

**3110-3111 ft:** intensely fractured zone (~1 ft), mostly fine grained carbonate clay w/ some surfaces covered w/ a brown mineral w/ sheen (soft)

**3112 ft:** ~1 cm thick calcite vn at ~65˚

**3118-3156 ft:**

**3157-3167 ft:** gray aphanitic ***andesite(?)***, grains are microcrystalline and difficult to positively identify, about 50% of rocks are patches of white (qtz+flds?) the remaining 50% is a gray mass w/ some very small shiny minerals (micas), many joints (.1 mm thick w/ black brown soft waxy mineral, few (~5%) have calcite) ~10/ft at ~60˚

 **3158 ft:** 3 fractures (180˚ to jnt set) at 30˚

**3160 ft:** moderate to intense fractured zone, ~10 cm (similar angle to jnt set and fracs at 3158 ft, only these are in many medium sized pieces)

**3163 ft:** ~5cm zone intensely fractured zone

**3167 ft:** 10 cm zone intensely fractured zone

**3168-3203 ft:**

**3204-3213 ft:** brown-gray (altered) aphanitic ***basaltic andesite***, microcrystalline xtls, lots whitish patches (flds, ~50% of groundmass), few small pock marks from vesicles, moderately fractured sealed (most commonly as a vnlt although some pieces are broken w/ slicks on the surface formed by the secondary mineralization) w/ brown mineral (serpentinite),

**3206 ft:** fracture at 37˚ w/ skicks raking at 35˚, rotating ~25˚ a second fracture at 50˚, similar fractures exist although occur in more intensely fractured areas and don’t allow for a confident measurement

**3208 ft:** 20 cm thick zone of intensely fractured rock w/ serpentinite on the surface

**3210-3212.5 ft:** intensely fractured zone w/ serpentinite on the fracture surface

**3214-3246 ft:**

**3247-3255 ft:** reddish-maroon colored vesicular aphanitic ***basaltic andesite***, most vugs have a thin (<1 mm) layer of a blackish brown mineral lining the vug wall, all xtls are microcrystalline (unidentifiable, but leave a consistent reddish brownish ground mass), reddish color likely due to oxidation from fluids in vesicles

**3247-3248 ft:** subhedral to euhedral calcite sealing a nearly vertical and very irregular fracture, teal chl (~1-3%) overprint up hole from the vn

**3251 ft:** two calcite vn (1 cm and 2 mm thick), at 45˚ drusey microcrystalline forming small layers and appear to be euhedral (subhedral?)

**3256-3293 ft:**

**3294-3303 ft:** gray aphanitic ***basaltic andesite***, no visicles, microcrystalline groundmass w/ unidentifiable minerals throughout

**3294-3296 ft:** moderately to intensely fractured zone, some fractures have serpentinite on the surface

**3296-3298 ft:** nearly vertical fracture w/ a thin layer of serpentinite on the surface, fracture pinches and swells (swells commonly have calcite), one thin cal vnlt at ~30˚ truncates on the main fracture

**3300 ft:** 12 cm thick zone of calcite sealed vn w/ small area of brecciated rock

**3301 ft:** silica (qtz)+cal vn at nearly vertical orientation, intensely fractured zone (~15 cm thick) down hole from main vertical fracture

**3304-3337 ft:**

**3338-3347 ft:** weakly vesicular aphanitic gray to dk gray ***basaltic andesite***, only one 10 cm zone w/ >5% vesicles (at 3338.5 ft) w/ a thin thin layer of black-brown secondary mineral linging the vug wall and some the remainder is filled w/ cal, the rest of the rock has <5% vesicles w/ brownish-black mineral filling vugs, microcrystalline groundmass is black and brown (olivine?) and most minerals are too small to identify

 **3342 ft:** fracture w/ a thin layer of calcite at 53˚

 **3345 ft:** moderate to intensely fractured zone (~10-15 cm thick)

**3348-3395 ft:**

**3396-3405 ft:** gray to dk gray vesicular aphanitic ***basaltic andesite***, microcrystalline groundmass w/ few plag lathes visible, vesicles from 1-15 mm across and commonly have a thin layer of blackish brown mineral, less commonly the vugs are filled w/ qtz or cal

 **3404 ft:** fracture at ~35˚ w/ several similar fractures in this box

**3406 ft:** intensely fractured zone ~30-40 cm thick, calcite is in some vugs (incompletely filled)

**3406-3434 ft:**

**3435-3444 ft:** gray w/ brown patches aphanitic ***basaltic andesite***, microcrystalline ground mass is gray and brown xtl that are unidentifiable, brown patches may be serpentinized basalt(?), tr cal filling void spaces

**3435-3436 ft:** moderately fractured, thin film of serpenitinite on some fracture surfaces, just downhole of fractured area is a 2 mm thick qtz vnlt, some rock appears to be brecciated w/ brownish mineral sealing fractures

**3440 ft:** intensely fractured zone (~20 cm thick), tr chl

**3441 ft:** brecciated zone, clasts are subrounded to subangular, brown serpentinite forms matrix

**3442 ft:** intensely fractured zone (~10 cm), downhole fracture face at 40˚ w/ cal+serp

**3445-3480 ft:**

**3481-3491 ft:** gray aphanitic ***basaltic andesite***, groundmass is mostly white-gray microcrystalline xtls of plag, some spots w/ black pyx, no vesicles

**3481 ft:** 0.5-2 cm thick cal vn, layered w/ serpentinite+/-chl(?), occur at several orientations but cross cutting nature and irregular shape does not allow for confident measurements

**3483.5 ft:** 0.5 cm thick cal vn at ~50˚, slicks rake at 22˚, other irregularly shaped cal vns of a smaller size are near by this larger vn

**3485 ft:** moderately fractured zone, some broken pieces others still sealed together w/ serpentinite on surface

**3489 ft:** 2-3 cm thick interlayered cal+serp vn, roughly oriented at 30˚

**3490 ft:** ~ 1 cm thick cal vn at 60˚, one similar fracture nearby, thin amounts of serp on fracture surface

**3492-3525 ft:**

**3526-3535 ft:** brown and dk gray aphanitic vesicular ***basaltic andesite***, plag lathes in groundmass make up ~10%, the remaining groundmass is microcrystalline and difficult to identify, vesicles are small (<0.5 cm) and commonly filled w/ a black-brown mineral

 **3535 ft:** intensely fractured zone (~20 cm thick)

**3574-3577 ft:** brown-gray aphanitic vesicular ***basaltic andesite***, vesicles are commonly filled w/ a soft black mineral, microcrystalline groundmass w/ unidentifiable minerals

**3576-3577 ft:** intensely fractured, slightly clay altered (crumbly) basalt, seems to be a significant fault contact between underlying sandstone and overlying basalt, the clasts in the sandstone are basaltic similar to the fragments in the faulted zone

**3578-3582.5 ft:** brown to gray very fine to medium grained, subangular ***basaltic sandstone/breccia***, matrix doesn’t fizz (no carbonate)

**3583 ft:** porphyritic dk gray ***basaltic andesite***, irregular contact, 1-2 mm long plag lathes are porphyritic in an aphanitic groundmass (microcrystalline, unidentifiable), no vesicles

**3584-3620 ft:**

**3621-3622 ft:** very fine to fine grained dk gray ***basaltic andesite***, no vesicles, xtls are euhedral consisiting of visble plag and pyx, at contact w/ underlying layer is a 1 mm thick cal vn

**3622-3631 ft:** dk gray to reddish gray aphanitic vesicular ***basaltic andesite***, most commonly the vugs are filled w/ a soft black mineral (chl?) less commonly (~1-5% of vugs) are filled w/ calcite and one occurrence of silica (at 3623 ft), ground mass is slightly altered to clay (leaving a reddish color and slightly crumbly)

 **3630 ft:** intensely fractured zone, ~12 cm thick

**3632-3666 ft:**

**3667-3677 ft:** gray to dk gray porphyritic vesicular ***basaltic andesite***, most vesicles are small (<0.5 cm) and filled w/ a soft black mineral w/ <5% of vugs filled w/ calcite, ~20% porphyritic plag lathes (<2 mm long) in a aphanitic groundmass

**3673-3675 ft:** moderately fractured, possibly mechanical as they are mostly horizontal fractures

**3677 ft:** 3 cm zone of intensely fractured rock

**3678-3710 ft:**

**3711-3721 ft:** gray to dk gray porphyritic vesicular ***basaltic andesite***, most vesicles are small (<0.5 cm) and filled w/ a soft black mineral w/ ~5% of vugs filled w/ calcite, ~20% porphyritic plag lathes (<2 mm long) in a aphanitic groundmass

 **3711 ft:** moderately fractured zone (~7 cm)

**3721 ft:** clay+chl and groundmass is reddish brown in moderately fractured zone and nearby rock

**3722-3758 ft:**

**3759-3768 ft:** brown to gray porphyritic vesicular ***basaltic andesite***, <1 mm long porphyritic plag lathes form ~15% of total rock w/ an aphanitic brown (altered to clay) groundmass, vesicles are filled w/ a soft black mineral and tr calcite

**3760-3761 ft:** moderately fractured ~25 cm thick zone, w/ the upper most portion intensely fractured to small pieces (<2 cm thick zone)

**3763 ft:** moderately fractured zone, ~20 cm thick

**3767 ft:** moderately fractured zone w/ thin silica film on fracture surface, ~4 cm thick

**3769-3805 ft:**

**3806-3817 ft:** brownish gray aphanitic vesicular ***basaltic andesite***, some plag xtls are visible, but at <0.5 mm long they are not much larger than surrounding gray ground mass, vesicles commonly have soft black mineral (chl?), some larger vesicles are filled w/ calcite (~5% of total vugs)

**3807 ft:** ~1 mm thick chl+cal vnlt at ~80˚ w/ associated splays in ~ 30 cm zone

**3814 ft:** intensely fractured zone, ~15 cm thick zone, fracture face near most downhole portion of zone at 82˚ w/ chl on face

**3818-3852 ft:**

**3853-3864 ft:** gray to dk gray vesicular aphanitic ***basaltic andesite***, vesicles are mostly <0.5 cm (rarely are 2 cm) generally filled w/ soft black mineral (chl), larger vesicles have calcite, commonly pock marked from interconnected vesicles w/ microfractures

 **3862 ft:** 2 mm cal+chl vn, near 2 cm intensely fractured zone

**3865-3897 ft:**

**3898-3901 ft:** gray to brown aphanitic ***basaltic andesite***, entire section is moderately fractured (seems to be near vertical but cross cutting fractures don’t allow for accurate measurement), homogenous aphanitic groundmass

**3902-3907 ft:** reddish brown to gray aphanitic vesicular ***basaltic andesite***, contact is a fault at 60˚, vesicles are filled w/ soft black mineral (<0.5 cm across), tr chl overprint

**3908-3945 ft:**

**3946-3955 ft:** reddish brown to gray aphanitic vesicular ***basaltic andesite***, some visible plag lathes in groundmass are <1 mm, in patches of reddish area black pyx + plag is formed w/ surrounding red Fe Ox surrounding, vesicles are larger (commonly between 1-3 cm, although smaller vesicles exist), filled w/ black mineral (chl), very few fractures through out expect a lt to mod fractured zone at 3948 ft

**3956-3997 ft:**

**3998-4000 ft:** gray to slightly reddish brown aphanitic ***basaltic andesite***, small fractures are sealed w/ calcite, homogenous groundmass w/ microcrystalline plag and other unidentifiable minerals, few small pock marks (small vesicles <3 mm) and fractures are filled w/ soft black mineral (chl?), reddish color comes more prominent near bottom of unit near fault

**4001-4005 ft:** maroon altered aphanitic vesicular ***altered basaltic andesite***, microcrystalline groundmass w/chl over print, vesicles are small (<0.5 cm) w/ black (chl?) mineral filling space

**4001-4002 ft:** intensely fractured zone w/ clays, fault, likely promoting alteration surrounding fault

**4003-4045 ft:**

**4046-4056 ft:** gray to dk gray aphanitic vesicular ***basaltic andesite***, microcrystalline anhedral to subhedral plag makes up ~45% of the groundmass w/ the remainder being a gray mass of unidentifiable mineral, vesicles are most commonly filled w/ a soft black mineral w/ <1% filled w/ calcite, very few fractures throughout box

**4046 ft:** 4 cm thick intensely fractured zone near break in drilling zone, possibly a result of drilling

**4057-4141 ft:**

**4142-4150 ft:** gray to dk gray aphanitic vesicular ***basaltic andesite***, few plag lathes visible (~15% of groundmass) and euhedral microcrystalline pyx (majority of groundmass, <0.5 mm long xtls), vesicles and some micro-fractures are most commonly filled w/ soft black mineral w/ tr-0.5% filled w/ calcite

**4143 ft:** 7 cm thick intensely fractured zone, little secondary mineralization (softer than pick harder than fingernail, formed in layers)

**4146-4150 ft:** moderately to intensely fractured zone (fault?) w/ some clay and soft black mineral on fracture surfaces

**4151-4187 ft:**

**4188-4199 ft:** gray aphanitic ***basaltic andesite***, microcrystalline groundmass w/ equant plag and other minerals, few fractures/vugs

**4198 ft:** moderately fractured w/ serpentine and a thin layer of silica coating fracture surface, fracture at 45˚ (main fracture)

**4200-4247 ft:**

**4248-4255 ft:** gray w/ some areas that have a slight reddish tint, aphanitic vesicular ***basaltic andesite***, microcrystalline anhedral to subhedral plag makes up ~45% of the groundmass w/ the remainder being a gray mass of unidentifiable mineral, vesicles and micro-fractures are commonly filled w/ a soft black mineral w/ tr-1% filled w/ calcite, some vesicles are merely pockmarks w/ no secondary mineralization (possibly has fallen out of the vug, but vast number makes that seem unlikely), few fractures throughout box (most appear mechanical)

**4256-4290 ft:**

**4291-4302 ft:** gray w/ patches of red tint aphanitic weakly vesicular ***basaltic andesite***, microcrystalline groundmass w/ ~40% plag and unidentifiable gray minerals (presumably pyx), vesicles are filled soft black mineral uncommonly vesicles are filled w/ calcite

 **4293 ft:** intensely fractured zone ~4 cm thick

**4300 ft:** ~1 cm thck cal vn at ~30˚ w/ moderately fractured zone (~10 cm) just down hole of vn

**4302 ft:** moderately fractured zone w/ serpentine on fracture surface

**4303-4339 ft:**

**4340-4347 ft:** gray aphanitic vesicular ***basaltic andesite***, groundmass is microcrystalline w/ no readily identifiable minerals, vesicles (small, pock mark) are lined w/ chl and ~5% are filled w/ calcite, weak chl overprint, few fractures (at ~50˚) most have calcite on surface

**4338-4380 ft:**

**4381-4395 ft:** gray to gray w/ reddish tint, aphanitic vesicular ***basaltic andesite***, groundmass is microcrystalline w/ no readily identifiable minerals, vesicles (small, pock mark) are lined w/ chl and ~1% are filled w/ calcite, few fractures (commonly at ~50˚)

**4392 ft:** moderate-intensely fractured zone w/ calcite and chl on surface (~5 cm thick)

**4396-4431 ft:**

**4432-4441 ft:** gray aphanitic ***basaltic andesite***, some small vesicles and micro-fractures leaving rock pock marked are commonly filled w/ calcite and/or black mineral, groundmass is microcrystalline w/ ~30% white plag areas surrounded by dk gray groundmass

 **4432-4233 ft:** moderately fractured zone

**4435-4436 ft:** ~0.5 cm thick cal vn at 60˚, downhole rock has reddish tint (~20 cm thick zone) w/ ~10 cm of moderately fractured below that

**4438 ft:** moderately fractured zone (~7 cm) distinct fracture at ~53˚

**4442-4476 ft:**

**4477-4485 ft:** gray aphanitic ***basaltic andesite***, microcrystalline groundmass of unidentifiable (too small) minerals, moderately fractured throughout w/ thin layers of calcite on fracture surface.

**END HOLE**

**Fallon 84-31: 0-5942 ft**

­­\*\*Thin section at every 100 ft interval

**0-100ft:** No sample

**110- 420ft:** fine to coarse grained, subangular to subrounded, gray ***qtz-rich lithic sandstone***, w/ ~80% qtz, 5% plag, 15% black/green/red lithic fragments and micas, carbonate cemented, cemented by carbonate, grain size is mostly consistent w/ some intervals having less abundant coarse grains

**240-270 ft:** softer than pick white mineral, about 5-10%, not a clast, secondary mineral? Zeolite?

**420-660 ft:** fine to medium grained subrounded lt gray ***tuffaceous sandstone***, qtz and white very fine grained white to pale yellow, green or pink tuffaceous pieces, w/ minor amounts of dk gray lithic fragments, weak carbonate cement, green may be from chl alteration (most abundant at 660’ and extends into the underlying unit through 700’)

**680-760 ft:** tan to buff, white and teal ***non-welded lithic tuff***, ~15% chl as overprint and altered groundmass, some pieces are homogenously fine grained tuff, some are more conglomerate like w/ 0.5 mm clasts commonly dk teal or dk gray (basaltic?) w/ a matrix w/ a light teal overprint, qtz is common as a secondary mineral associated w/ tr py, <1% opal, patchy chl in vns

**770-930 ft:** chl altered, dk gray, aphanitic ***basaltic andesite***, some pieces are very finely crystalline w/ pyx being the most easily identifiable mineral well formed in a plag matrix, some vesicles filled w/ chl, tr epidote found as well

**840 ft:** clear subhedral to euhedral calcite (secondary) and an orange spot on chl

**860 ft:** opaque softer than pick orange mineral, appears to be a layer of secondary alteration amongst chl

**940-950 ft:** fine to coarse grained, subangular to subrounded ***basaltic sandstone***, cemented by carbonate, some clasts are overprinted by chl (~10%) w/ the remainder being a dk gray basalt, many void spaces are filled by calcite and chl

**960-1100 ft:** chl altered, dk gray, aphanitic ***basaltic andesite***, some pieces are very finely crystalline w/ pyx being the most easily identifiable mineral well formed in a plag matrix, some vesicles filled w/ chl, cal and tr epidote found as well, few pieces found throughout are sandstone (downhole contamination? Interlayered basalt and basalt sandstone?)

**930 ft:** abundant calcite, ~10-15% (vn?)

**1060-1100 ft:** brown to red colored altered basalt, tr py

**1110-1150 ft:** white w/black speckled angular, fine to coarse grained ***non welded tuff***, most clasts (~75%) are plag or qtz, ~15% bt, 10% of clasts are altered by chl and are teal in color, some patches of very pale yellow (possibly sericite? Possibly chl?), weak carbonate cementing, top of unit is stained light to medium red where chl is more abundant (20-25%)

**1160-1170 ft:** gradational contact to white to light red/pink aphanitic vesicular ***welded tuff***, vesicles are very small (<0.5 mm) and often filled w/ secondary minerals (mostly chl w/ a thin red film on the wall), moderate to intensely overprinted w/ chl, some pieces of overlying unit (more abundant in upper portion)

**TS; 1170 ft:** Fine grained xtl rich w/ fine grained plag and larger plag less common and musc, lithic fragments (basaltic andesite) also found in groundmass, cal+chl in void spaces, chl overprint on groundmass

**1180-1190 ft:** gray-brown, fine to coarse grained angular ***non-welded tuff/reworked tuff***, qtz and plag make up ~50%, 10% bt, ~30% are red/black lithic fragments, ~10% chl overprinted clasts, weak carbonate cement w/ few larger calcite crystals

**1200-1240 ft:** gray and brown aphantic, weakly altered (bleached) ***basaltic andesite***, microcrystalline w/ common secondary minerals w/ ~10% of chips having silica film on surface or are all qtz, chl is common as overprint on ~5% of chips unless otherwise noted

 **1200-1210 ft:** chl only makes up ~1%

**1240 ft:** chl makes up ~15% of chips, intense teal some bits attached to vesicle wall, others chl chips appear to be a cast of vesicles

**1250 ft:** most chips are stained red (Fe Ox?), about half the chips are similar aphanitic basaltic andesite, others are sandstone w/ a basaltic andesite composition of clasts

**1250-1260 ft:** lt gray, white, and red pieces of porphyritic ***basaltic andesite,*** weakly vesicular (only very small vesicles seen) and weakly porphyritic (~5% of rock is made of porphyritic acicular pyx xtls), chl is commonly seen as ~5% of chips unless otherwise noted, groundmass is microcrystalline (possibly silicified as it is harder than a pick and appears to have a slight sugary sheen, slightly translucent), Thin sections show porphyritic plag w/ oscillatory zoning, few olivine xtls (slightly porphyritic in plag matrix, and few/no qtz xtls not found in groundmass

**1270-1380 ft:** white porphyritic fine grained ***ashflow tuff***, possibly reworked, no vesicles seen, few secondary minerals (chl), white/buff colored aphanitic matrix w/ ~0.5-1 mm thick bt xtl speckled through out, some pieces are clasts of similar composition cemented together ( or possibly a crumbly fine grained granite (plag/qtz/bt)

**TS; 1290 ft:** plag xtls in weakly aligned flow fabric, ~1% bt in fine grained plag rich groundmass, fine grained plag is often grungy from clay alt

**TS;** **1370 ft:** fine grained grungy weakly foliated plag xtls make up a fine rained matrix w/ porphyritic plag and bt, densely welded ashflow tuff

**1390-2080 ft:** lt gray, white, and red pieces of porphyritic ***andesite,*** weakly vesicular (only very small vesicles seen) and weakly porphyritic (~5% of rock is made of porphyritic acicular pyx xtls), chl is commonly seen as ~5% of chips unless otherwise noted, groundmass is microcrystalline (possibly silicified as it is harder than a pick and appears to have a slight sugary sheen, slightly translucent). Thin sections show several pieces w/ qtz in groundmass w/ a weak fabric defined by plag xtls tr czo in vugs, qtz in void spaces as well, tr-2% volcanic glass, could be dacitic in composition

**1390-1420 ft:** intense chl overprinting, ~25% of rock chips are coated in chl

**1430-1460 ft:** some pieces are similar composition fragments cemented together

**1730 ft:** few pieces of carbonate cemented sandstone (probably contamination from above)

**TS; 1800 ft:** ~10% hbl, porphyritic in fine plag groundmass, several porphyritic plag xtls as well

**1820-1880 ft:** chl is more abundant (~15-20%)

**1880-1940 ft:** increase in larger porphyritic pyx/hbl (~20% of rock), some pieces have porphyritic plag as well (~5%)

**TS; 1900 ft:** very fine grained groundmass w/ nearly non visible xtls, some cal vns

**2090-2380 ft:** gray and brown aphantic ***basaltic andesite***, microcrystalline w/ some visible plag lathes, other minerals are difficult to identify, silica chips (vn/vug fill?) make up ~1-5% of total chips, tr chl (1-5% of chips)

**2110 ft:** about 35% of chips are rhyolite in composition, possibly downhole contaminations, but more abundant than expected for contamination.

**2190 ft:** red stained (FeOx) groundmass, similarly red chips found just below this depth, but most likely contamination

**2310 ft:** ~15% of chips are a light gray porphyritic rhyolite w/ visible plag and hbl xtls in an aphanitic matrix

**2350-2370 ft:** chips are light tan-buff colored w/ few (~5% of chip) porphyritic hbl xtls

**2390-2410 ft:** tan-buff to gray angular coarse grained ***basaltic sandstone***, qtz, and gray, black and red lithic fragments, some light gray basaltic fragments have small vesicles and/or porphyritic hbl xtls, carbonate cemented,

**2420-2970 ft:** gray and brown w/ few areas of patchy light red overprint, aphantic ***basaltic andesite***, microcrystalline w/ some visible plag lathes and some pyx xtls visible at some intervals, other minerals are difficult to identify, silica chips (vn/vug fill?) make up ~1-5% of total chips, tr chl (1-5% of chips)

**2620-2630 ft:** ~50% of chips are light pink-red w/ larger bt books (~1mm across, 0.5 mm thick) and qtz xtls probably represents interlayered rhyolite and basaltic andesite flows

**2730-2740 ft:** 5-10% of chips are silica, more than surrounding areas

**2870 ft:** 5% silica chips, small

**2980-2990 ft:** white to light gray, fine grained subangular ***volcaniclastics***, fragments are mostly qtz and plag w/ a light gray matrix, ~25% of clasts are a dk gray basaltic andesite fragment, tr secondary qtz/cal

**3000-4380 ft:** gray and brown w/ few areas of patchy light red overprint, aphantic ***basaltic andesite***, microcrystalline w/ some visible plag lathes and some pyx xtls visible at some intervals, other minerals are difficult to identify, silica chips (vn/vug fill?) make up ~1-5% of total chips, tr chl (1-5% of chips)

 **3700 ft:** No Sample

**3740 ft:** about 50% of chips are lt-mod gray, possibly a more andesitic composition

**3800 ft:** lt gray chips w/ porphyritic xtls, few pieces w/ a weak foliation (bt?), could be andesite or a weakly welded ash tuff

**3860 ft:** No Sample

**3980 ft:** 15% of chips are cal+/-qtz

**4040 ft:** No Sample

**4080-4120 ft:** almost all chips have a red FeOx stain

**4400 ft:** 75% of chips are white to lt gray (slight blue/green tint on many pieces) that are fairly soft but have some qtz xtls, qtz xtl ashflow tuff, **fault??**

**4420-5260 ft:** 35-65% of chips are lt gray w/ green or red tint, softer ash flow tuff, remainder of chips are similar basalt to overlying flows suggests that this interval is ***interlayered basaltic andesite and ashflow tuff***, tr-0.5% py and chl alteration, unit is bracket by vn rich intervals (at 4420 and 4820 ft) and surrounded by basalt (possibly two faults?), thin sections from this depth confirm this with fine grained grungy ashflow tuff chips w/ interstitial calcite occurring in ~25% of chips and basalt chips where plag xtls are commonly hosted in an olivine matrix or as just fine plag xtls

**TS; 4700 ft:** cal in void spaces is fairly common and replaces groundmass in some chips, plag xtls are still porphyritic in cal matrix, patches of ashflow are qtz rich at this interval

**4800 ft:** qtz+py (tr) vn chips are 20% of the chips amongst other light colored ash tuff

**4800-4820 ft:** ash chips up to 75% of total chips, much lighter than nearby ash flow chips, much more white chips likely a result of bleaching from vn at 4800 ft?, **fault?**

**4840 ft:** dk gray-black shale/siltstone (?) only, tr py disseminated and <1 mm qtz vnlts

**4920-4980 ft:** >70% of chips are dk gray w/ slight brown tinge aphanitic basaltic andesite

**5280-5920 ft:** 20-65% of chips are white qtz+/-cal+py vn annealed quartzite chips with the remainder being med-dk gray basaltic andesite in an ***interlayered basaltic andesite and cal (?) quartzite***, tr py found disseminated w/in meta seds, thin section

**5620-5920 ft:** 15-20% of chips are pale green to lt gray ashflow tuff, consistency of occurrence suggests that these chips are in fact interlayered amongst quartzite and a minor basaltic component t (~20%) rather than down hole contamination, thin section

**END HOLE**

**Fallon 86-25: 0-5020 ft**

**0-120 ft:** No sample

**140-200 ft:** light gray-white, fine to very coarse grained rounded ***qtz rich lithic sandstone***, ~75% qtz, 10% flds, 10% black and red aphanitic lithic fragments, 5% micas (bt and fuchsite) and tr pyx, carbonate cemented

**220-360 ft:** light gray-white, very fine to med, rounded ***qtz rich lithic sandstone***, similar composition as overlying unit, but very few coarse grains, mostly fines w/ some medium grains, carbonate cemented

**380 ft:** light gray-white, fine to very coarse grained rounded ***qtz rich lithic sandstone***, ~75% qtz, 10% flds, 10% black and red aphanitic lithic fragments, and 5% micas (bt and fuchsite), carbonate cemented

**400-2320 ft:** light gray-white, very fine to med, rounded ***lithic sandstone***, similar composition as overlying unit expect less qtz more flds and black/red lithic fragments and very few coarse grains, mostly fines and medium sized grains unless otherwise noted, carbonate cemented, fine grained and coarse grained dominated layers are interlayered throughout this interval

 **500-560 ft:** mostly fine grained clasts

**720-1040 ft:** clasts dominated by fines w/ intermediate amount of medium grains

**920 ft:** about 1 cm wide cavity w/ a very thin film of silca coating on the surface

**1120-1340** **ft:** mostly fine grained clasts w/ few coarse grains and some medium sized grains, well consolidated

**1480-1500 ft:** mostly fine grained clasts w/ few coarse grains and some medium sized grains, well consolidated

**1630-1720 ft:** mostly fine grained clasts w/ few coarse grains and some medium sized grains, well consolidated

**1640 ft:** thin (<0.5 mm thick) soft yellow vn mineral (possibly orpiment or it could be some contamination from drilling?)

**1780 ft:** very coarse grianed clasts present

**2000 ft:** brownish-med gray color stands out from surrounding white-lt gray rock, fine grained w/ very few larger clasts

**2160-2280 ft:** mostly fine grained clasts w/ few coarse grains and some medium sized grains, well consolidated

**2300 ft:** gray to dk gray lithic fragments are more common (~30%)

**2340-3060 ft:** med gray-dk gray to brown weakly porphyritic (plag) ***basaltic andesite***, plag lathes are commonly visible under microscope (<0.5 mm long), groundmass around plag is microcrystalline dk black, some red tinted pieces and tr chl, silica chips exist as <1% unless otherwise noted

**2340-2360 ft:** somewhat gradational boundary where basaltic fragments are more prominent (~35%) and increase to almost all the chips at 2380 ft

**2400 ft:** silica chips present as ~5% of chips (vn?)

**2620 ft:** thin (<0.5 mm thick) soft yellow vn mineral (possibly orpiment or it could be some contamination from drilling?), similar soft mineral w/ thin shape remnant of a vn is red-orange

**2660 ft:** most chips are coated in a tan clay carbonate mixture (weak HCl rxn, soft fine sed on lithic fragment), possibly drill mud or seds from above

**2680 ft:** 3-5% silica chips

**2740 ft:** most chips have a reddish maroon tint (FeOx) and one small occurrence of soft yellow mineral

**2820-2840 ft:** basalt is vesicular (small vesicles)

**2880 ft:** tr Py with cal, qtz chips make up about 3%

**2900 ft:** 5% silica chips

**2940 ft:** one large piece of fine grained tuff(?) gray in color w/ slight greenish tint, cal (3%)+py (tr) from fracture (? One piece found w/ rock next to vn minerals)

**3000 ft:** calcite present at ~5% of chips

**3060 ft:** 3% silica chips

**END HOLE**

**Fallon 82-36: 0-9501 ft**

\*\*Thin sections at ~100ft intervals

\*\*\*Chips put into trays are at 20ft intervals, uncommonly chips exist at 10 ft intervals, but sporadic occurrence of this did not warrant putting the odd intervals in the chip trays. These occurrences are more common down hole.

**0-30 ft:** No Sample

**40-100 ft:** lt gray/buff colored, subrounded ***lithic sandy siltstone***, very fine to medium grained clasts make mostly of qtz w/ few micas and some dk gray lithic fragments, silty matrix is dominate (carbonate cemented)

**120-1300 ft:** gray, fine to coarse grained subrounded to rounded ***lithic sandstone***, ~70% qtz, 5% flds, 25% lithic fragments composition similar to overlying unit, ratio of fines (or smaller) to medium grains (or larger) is variable throughout this section (interlayered silt- and sandstones?) moderately consolidated, carbonate/silica cemented (weak HCl rxn) where grains are still stuck together, matrix is about 30-50% unless otherwise noted

**120-160 ft:** very coarse grains and lithic pebbles present, poorly consolidated, very few fines

**380 ft:** No sample

**820-840 ft:** predominately fine and medium grained sandstone is mottled w/ patches of light pinkish silty areas

**1320-1500 ft:** fine to medium grained subrounded lt gray ***tuffaceous sandstone***, qtz and white very fine grained white to pale yellow tuffaceous pieces, w/ minor amounts of dk gray lithic fragments, weak carbonate cement

**1520-1580 ft:** gray, fine to coarse grained subrounded to rounded ***lithic sandstone***, ~70% qtz, 5% flds, 25% lithic fragments composition similar to overlying unit, ratio of fines (or smaller) to medium grains (or larger) is variable throughout this section (interlayered silt- and sandstones?) moderately consolidated, carbonate/silica cemented (weak HCl rxn) where grains are still stuck together

**1600-2020 ft:** fine to medium grained subrounded lt gray ***tuffaceous sandstone***, qtz and white very fine grained white to pale yellow tuffaceous pieces, w/ minor amounts of dk gray lithic fragments, weak carbonate cement

 **1640 ft:**  tr chl on surface of one pebble and very few chl fragments

**1860-2000 ft:** many fragments of very fine grained tuffaceous siltstone, similar composition, likely these beds are interlayered w/ some sandier layers

**2020 ft:** very finely crystalline lt gray rock w/ tr weakly foliated bt in qtz matrix, contact metamorphosed siltstone?

**2040-2080 ft:** brown, aphanitic ***basaltic andesite (?)***, equant microcrystalline groundmass of translucent minerals that are able to be sratched by a pick, appears to be basalt flows, possibly interlayered w/ siltstone giving quartzite type textures to some chips

 **TS; 2060 ft:** very fine grained qtz+flds in an ultra fine grained-glassy opaque) matrix, some xtls seem rounded and weakly annealed (possibly metamorphic), two pieces found are brecciated and sealed by calcite

**2100-2240 ft:** fine to medium grained subrounded lt gray ***tuffaceous sandstone***, qtz and white very fine grained white to pale yellow tuffaceous pieces, w/ minor amounts of dk gray lithic fragments, weak carbonate cement

**2260-3100 ft:** dk gray aphanitic weakly vesicular ***basaltic andesite***, most chips at these intervals is a microcrystalline basalt w/ few plag lathes and a finer brownish gray matrix, tr chl, qtz chips make up ~1% of total chips, some chips are reddish (oxidized), few sedimentary chips made of lithic fragments (rather than tuffaceous sandstone from overlying units) indicating either interbedded sandstone or fragments from this unit stuck together w/ drilling mud (the former seems most likely), light clay overprint is common

 **2320 ft:** Tr Py

**2320-2380 ft:** angular lithic fragments with carbonate cement become common at these depths, could be a distinct unit but more likely interlayered amongst basalt flows

**2540 ft:** some clay on surface of chips, qtz (silica polymorph) are more common (~5%), one piece of very rusty soft rock found (oxidation? Drilling related?)

**2720 ft:** about 1 cm thick piece of drusy vn calcite

**2740 ft:** medium to coarse grained basaltic sediments in fine matrix (interlayered in flow, made from fragments of underlying flows?)

**2760-2860 ft:** qtz chips are more common (3%), thin bluish gray silica on fragment surfaces and vugs are commonly lined w/ 0.5-1 mm of qtz

**2960-2980 ft:** medium to coarse grained basaltic sediments in fine matrix (interlayered in flow, made from fragments of underlying flows?)

**3120-3280 ft:** coarse grained, angular to subangular ***basaltic breccia/sandstone***, grain are angular and are ~85% dk gray basaltic fragments w/ an additional 5% of red oxidized fragments, the remaining 10% is mostly chl overprinted pieces w/ few white qtz/flds fragments (1-2%), weak carbonate cement

 **3220 ft:** ~10% of clasts are a white to tan soft fibrous mineral, chrysotile

**3300- ft:** dk gray to brown aphanitic weakly vesicular ***basaltic andesite***, most chips at these intervals is a microcrystalline basalt w/ tr chl, some chips are reddish (oxidized), few sedimentary chips made of lithic fragments indicating either interbedded sandstone or fragments from this unit stuck together w/ drilling mud (the former seems most likely)

**3500 ft:** One interval of a fine grained sedimentary rock w/ fragments of bt, pyx and some lithic fragments in a fine grained matrix (non carbonate), welded ash tuff (?)

**3540 ft:** one 0.5 cm thick qtz pebble found

**3560 ft:** 2% calcite, possibly from vug, but also could be from a fracture

**3560-3620 ft:** 20-40% of chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix

**3660 ft:** most chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix

**3700-3760 ft:** 20-40% of chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix

**3840 ft:** few sandstone chips, all chips are covered in fine clays (alteration? Fine grained matrix in sandstone?)

**3920-4020 ft:** 20-40% of chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix, some larger pieces are coated w/fine clays

**4060-4100 ft:** 20-40% of chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix, some larger pieces are coated w/fine clays

**4140 ft:** no sample

**4180 ft:** lt gray aphanitic vesicular ***andesite***, interlayered amongst basaltic andesite and basaltic sandstone/breccia, vesicles have secondary calcite filling void space, tr chl on surface of some fragments

**4200 ft:** qtz chips are ~5% of chips, some chips have light clay on surface

**4340-4360 ft:** most chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix, some larger pieces are coated w/fine clays, interlayered sedimentary unit

**4500-4520 ft:** light gray porphyritic ***andesite***, could possibly be basaltic, but some hbl xtls are visible making this a unique layer in the series of lava flows, tr chl, <10% of chips are sedimentary w/ some plag lathes as clasts

**4540- ft:** dk gray to brown aphanitic weakly vesicular ***basaltic andesite***, most chips at these intervals is a microcrystalline basalt w/ tr chl, some chips are reddish (oxidized), few sedimentary chips made of lithic fragments indicating either interbedded sandstone or fragments from this unit stuck together w/ drilling mud (the former seems most likely)

**4600 ft:** 20-40% of chips are basaltic sandstone/breccia weakly carbonate cemented, chips are coarse grained in a fine grained matrix, some larger pieces are coated w/fine clays

**4700-4720 ft:** coarse grained angular ***lithic sandstone***, clasts are ~75% plag, 15% dk gray basaltic fragments and 10% qtz, and tr chl carbonate cemented

 **4700 ft:** chips are about 50-50 lithic sandstone and basaltic andesite

**4740-4900 ft:** aphanitic weakly vesicular ***basaltic andesite***, most chips at these intervals is a microcrystalline basalt w/ tr chl, some chips are reddish (oxidized), few sedimentary chips made of lithic fragments indicating either interbedded sandstone or fragments from this unit stuck together w/ drilling mud (the former seems most likely)

**4920-5040 ft:** gray coarse grained angular ***lithic sandstone***, clast of plag xtls and lithic fragments (some dk gray basaltic and other lt gray and weakly porphyritic andesitic? pieces)

**5020 ft:** most chips are basaltic andesite with some clay/fines on surface (matrix? Clay alt?)

**5060 ft:** Py+qtz

**5060-5720 ft:** lt greenish gray to gray aphanitic ***basaltic andesite***, most pieces are microcrystalline w/ overprinted by clay alteration (chlorite hence greenish color), thin qtz vnlts are fairly common (~1-5 mm thick; 1-5% of chips have vns) and rarely have py associated w/ it, lighter colored pieces are silicified, few pieces are a pale red/pink, approaching qmon (underlying unit/dike) alteration becomes more intense

**5100 ft:** very fine silt powder is the only thing that was in the envelope, possibly an ash layer?

**5400-5440 ft:** dk gray aphanitic weakly vesicular ***basaltic andesite***, microcrystalline basaltic fragments, most chips are unaltered, some have a slight greenish tinge (chl), significantly less altered, tr py on a dk chl rich piece at 5420 ft where qtz chips are also more common

**5500-5640 ft:** weakly porphyritic w/ pyx xtls in microcrystalline groundmass

**5540-5600 ft:** few smaller (1-5 mm) cal vns

**5740-5760 ft:** white, fine to medium grained crystalline ***qtz monzonite***, 85% of rock is qtz w/ 10% bt (greenish, chl alteration) and 5% cal filling small void spaces (microfractures?) (strong HCl rxn) and 5% chl altered pyx, qtz mon is from previous 82-36 petrographic relationships, but a thin section would better define this rock, tr py, Thin section shows tr prehnite as radial xtls w/ cal alteration on flds in ground mass, crystals are quite fine grained could be better described as an aplite based on fine qtz/flds xtls

**5780-5920 ft:** lt greenish gray to gray aphanitic ***basaltic andesite***, most pieces are microcrystalline w/ overprinted by clay alteration (chlorite hence greenish color), thin qtz vnlts are fairly common, cal and ep are present as well, and rarely have py associated w/ it, lighter colored pieces are silicified, few pieces are a pale red/pink

**5900-5920 ft:** 5920 was described as a cataclasite in petrographic relationship, some pieces of white qtz mon, and most pieces have some clay on surface

**5940-6320 ft:** white, fine to medium grained crystalline w/ annealed texture ***altered qtz monzonite***, 90% of rock is qtz with a forest green mica (~5%; fuchsite? Chl overprinted musc?), cal is common in void spaces (significant HCl rxn), qtz diorite is from previous 82-36 petrographic relationships, but a thin section (at 6100, 6200, and 6300 ft) would better define this rock, euhedral py from 1-5% (this unit may be cut by qtz +/- cal vns, Thin sections show chl overprint is common, qtz grains have polygonal textures and commonly have subhedral cal grains commonly filling void places, other amorphous calcite alteration on flds (microcline and orthoclase), chl and clay alteration are common (grungy groundmass), tr smectite (?) and tr prehnite

**6000 ft:** one chip is a clast dominated basalt breccia w/ cal vnlts cementing clasts together

**6340-6460 ft:** lt greenish gray to gray aphanitic ***basaltic andesite?*** , most pieces are microcrystalline w/ overprinted by clay alteration (chlorite hence greenish color), thin qtz vnlts are fairly common, cal and ep are present as well, and py occurs at ~1-5%, lighter colored pieces are silicified, <40% of chips are white chips from qmon (?)

**6480-6580 ft:** white to buff colored, fine to medium grained crystalline w/ annealed texture ***qtz marble??*** 95% of rock is qtz and cal (strong HCl rxn, petrographic relationship calls this a qtz diorite but cal is too abundant for this to be the case) and 5% chl, qtz diorite is from previous 82-36 petrographic relationships, but a thin section (at 6500 and 6560 ft) would better define this rock, py from tr-1%

**TS; 6500/6560 ft:** trimodal distribution of chips w/ limey quartzite, quartzite and marble chips all existing, likely reflects ***interlayered meta-qtz sandstone/limestone***, possibly an altered rhyolite w/ hydrothermal tur+cal+chl overprinting ground mass,

**6600-6880 ft:** dk gray/black aphanitic ***basaltic andesite***, w/ disseminated py (~1%) in microcrystalline groundmass, commonly cut by cal vnlts, ~10-30% of chips through these intervals are metamorphics (some are marble from downhole contamination), cal/qtz vnlts are common, less altered than previous basaltic andesite

**6720-6760 ft:** lt gray metamorphic pieces occur as ~60-80% of chips, weak to moderate HCl rxn, ***qtz+cal vn?***

**6900 ft:** white to buff colored, fine to medium grained crystalline w/ annealed texture ***cal-quartzite*** 95% of rock is qtz and cal (strong HCl rxn, petrographic relationship calls this a qtz diorite but cal is too abundant for this to be the case) and 5% chl, qtz diorite is from previous 82-36 petrographic relationships, but a thin section would better define this rock, py from tr-1%, cal vnlts, some chips are qtz rich w/ green mica (fuchsite/chlorite?), Thin sections show that qtz is more abundant than calcite

**TS; 6900 ft:** 70% of chips are annealed qtz w/ minor cal+ep (tr) in a quartzite, one piece found is folated w/ fine grained qtz and opaques (define folition), 30% of pieces are ash tuff w/ some porphyritic qtz in fine grungy groundmass

**6920-7000 ft:** No Sample, fault??

**7020-7680 ft:** lt gray to pastel green/red colored (mottled texture), crystalline ***?silicified volcaniclastic?????***, matrix is very fine grained qtz (pick leaves metal behind, could be silicified), relict plag phenocrysts are weakly deformed, about 5% of rock is coarse grained bt books and lithic fragments often w/ cal, light green tint on all chips (chl?), tr-1% disseminated py, cal is found in void spaces (~1%), welded ash flow tuff is from previous 82-36 petrographic relationships, but a thin section (at 7040, 7140, 7240, 7340, 7440,7540, and 7640 ft), Thin sections show a very fine grained qtz w/ chl overprint w/ porphyritic flds, chips are 90% fine grained matrix w/ ~5% qtz and ~5% flds as coarse grains

**TS; 7040 ft:** Ep is very fine grained found in void spaces (vns and vugs)

**7120-7140 ft:** chips are darker, but still are have a pale/pastel nature, some <0.1 mm long flds xtls are visible in the matrix, likely this is a silicified basaltic andesite?, one large fragment of unaltered basalt w/ 2% disseminated py

 **TS; 7140 ft:** Ep alt on groundmass

**7160 ft:** few chips have green tint, most are a milky white w/ a very pale yellowish tint

**7220-7280 ft:** chips are darker, but still are have a pale/pastel nature, some <0.1 mm long flds xtls are visible in the matrix, likely this is a silicified basaltic andesite?

 **TS; 7240 ft:** EP+qtz vn and vugs, chips are ~60% fine grained plag rich basaltic andesite and 40% crystal-ash flow tuff w/ porphyritic flds, clay alt is common on all chips

**7380-7680 ft:** chips are darker, but still are have a pale/pastel nature, some <0.1 mm long flds xtls are visible in the matrix, lithic fragments (basaltic often w/ dissem py) are more common but still have silicified pale overprint over the whole rock

**TS;** **7540 ft:** chips are mostly plag rich basaltic andesite w/ few ash flow pieces from DH contamination(?)

**TS;** **7640 ft:** cal vn + disseminated pieces, mostly very fine ash tuff w/ fine qtz, some basaltic andesite pieces but likely are DH contamination, slight clay alteration w/ tr py (QSP alteration?)

**7740-7800 ft:** milky white, fine-grained ***felsic volcanics densely welded in ash flow***, weakly annealed texture w/ ~0.5-1% disseminated py, crystalline texture but most xtls are aphanitic anhedral, no rxn w/ HCl, silicified and altered. (thin section at 7740 ft), possibly another thin section at another depth

**TS; 7740 ft:** cal vn w/ tr chl, qtz phenocrysts commonly have resoption textures, flds are pophyritic (~10-20% of total rock) and have significant clay alteration, tr py, tr prehnite

**TS;** **7760 ft:** qtz rich grungy ash tuff (<25% of chips is larger qtz xtls), tr interstitial cal +ep w/ some porph flds xtls in tuff

**7800 ft:** About 20% of chips are maroon tinted w/ <0.5 mm long plag xtls are porphyritic in aphanitic groundmass w/ slight green tint overprinting

**7820-9480 ft:** pastel green/maroon to lt gray, ***ashflow tuff w/ few interlayered basaltic andesite lava flows*** relict clasts are fine grained and are sub-rounded to subangular and are qtz/flds and some lithic fragments w/ chl overprint, weakly annealed texture, ~1-2% py disseminated and in vnlts, pale color and green overprint are a result of alteration (silicification and chl respectively), tr-2% ep, HCl rxn is common (cal in microfractures and replacing groundmass), welded ash flow tuff is from previous 82-36 petrographic relationships, but a thin section (found throughout this section) this unit is marked by alteration and metamorphosed interlayered tuffaceous/lithic sandstone and basaltic andesite

**7820-7960 ft:** dk gray, mafic comp?

 **TS; 7840 ft:** ashflow w/ lithic fragments, non welded, chl is common (25%), <5% musc, larger flds (plag) are porphyritic in ash groundmasss (10%), clay alteration

**7880 ft:** <0.5 mm cal vnlt

**7940 ft:** cal vnlt <0.5 mm, groundmass of wall rock also reacts strongly w/ HCl, cal replacing plag?

**TS;** **7940 ft:** chips are ~70% basaltic andesite mostly plag w/ some alt (clay+preh), 30% are ash flow (contamination? Interlayered?) w/ calcite in void spaces, chl overprints ~35% of chip

**7980-8040 ft:** lt gray, qtz rich w/ few dk gray lithic fragments, felsic?

**TS;** **8040 ft:** flds+qtz porph/clasts in ashy matrix, significant clay/chl alteration, one chip found w/ chl +cal vn in basaltic andesite, basaltic andesite chips are <10% probably contamination

**8060-8120 ft:** maroon colored chips mafic?

**8100 ft:** cal+qtz+chl vn, half of chip is a milky qtz rich (silicified? No HCl rxn) wall rock w/ tr bt w/ attached clear qtz/cal w/ some green chl in the vn

**8140-8180 ft:** lt colored chips

**TS;** **8140 ft:** very fine grained qtz+flds groundmass w/ significant clay alteration in an ashflow tuff

**8200-8240 ft:** dk colored chips mafic? Chl alt.

**8240 ft:** ~5% of chips are pure qtz

**8260-8280 ft:** chips are lighter in color, mostly white to lt gray quartzite(?)

**TS; 8280 ft:** qtz rich ash, qtz grains up to 0.5 mm are weakly annealed in aggregates up to 2 mm found in fine grained grungy groundmass, t rep alteration in groundmass

**8300-8600 ft:** gray/green medium dk silicified altered mafics?

**TS;** **8480 ft:** ultra fine grained qtz rich grungy ashy groundmass, some calcite replacement few larger qtz grains (annealed, subrounded possibly represents filling of void spaces but more likely larger crystals in ashflow slightly welded

**8620-8660 ft:** lt colored chips spots of chl, felsic?

 **TS; 8640 ft:** qtz vns, xtl rich tuff, some chl in vug as well as ep

**8680-8720 ft:** dk gray aphanitic crystalline, silicified basaltic andesite?

**8740-8800 ft:** lt gray to greenish silicified chips, felsic?

**TS; 8740 ft:** chl in void spaces, ash tuff w/ several xtls (porphyritic) of flds and qtz

**8820-8960 ft:** dk gray aphanitic crystalline, silicified basaltic andesite?

 **TS;** **8840 ft:** ash flow tuff

**TS; 8940 ft:** cal +prehnite vn, very fine grained compared to surrounding intervals (no porphyritic xtls)

**8980-9020 ft:** lt gray to greenish silicified chips, felsic?

**9020ft:** ~1 mm vnlt of cal on fracture surface, most chips are a white to gray quartzite

**9040-9320 ft:** dk gray aphanitic crystalline, silicified basaltic andesite?

**TS;** **9040 ft:** vugs filled w/ chl+ep+qtz, fine grained ash w/ some porphyritic xtls, clay alteration and vnlts

**TS; 9140 ft:** ep+chl alteration, most chips are fine grained xtl rich are possibly DH contamination

**TS; 9240 ft:** Ashflow tuff, few porphyritic xtls

**9080ft:** cal vnlts

**9340 ft:** white-lt gray porphyritic dk green micas and clear qtz in a translucent white qtz matrix

**TS; 9340 ft:** xtl rich ash flow

**9360-9480 ft:** dk gray aphanitic crystalline, silicified basaltic andesite?

**TS; 9440 ft:** ep vns and vugs in basaltic andesite, other chips are ashflow

**END HOLE**

**Fallon 61-36: 0-7010 ft**

\*\*Thin sections at ~100 ft intervals

\*\*Intervals are at every 20 ft beginning at 130 ft where 130 ft represents 130-150 and 150 represents 150-170 etc.

**0-130 ft:** No samples

**130-150 ft:** very fine light gray ***lithic siltstone***, less than 5% are fine grained clasts, matrix is carbonate cemented

**170-1450 ft:** brown-gray fine to coarse grained, subrounded to subangular ***qtz rich lithic sandstone***, grains are ~70% qtz 20% black/red/green lithic fragments and 10% flds, weakly carbonate cemented where larger grains are the most poorly consolidated,

**1470- 1710 ft:** med to dk gray, fine to coarse grained, subangular to subrounded ***lithic sandstone***, grains are 55% dk gray (some red) lithic fragments, 30% qtz, 15% flds, clast dominated, weakly to moderately consolidated, in a carbonate matrix

**1730-1790 ft:** dk gray subrounded to angular fine to pebble sized ***basaltic sandstone/breccia***, most large pieces (~1 cm of fine crystalline basalt/gabbro, angular pieces) are at 1730 ft w/ slightly less at 1750 ft which could indicate a dike, below this depth lithic fragments make up about 75%, 15% qtz and 10% flds

 **1750 ft:** tr chl overprinted clasts

**1810-2530 ft:** lt gray to brown, subrounded to subangular, fine to coarse grained ***lithic sandstone***, grains are 55% qtz, 30% flds, 15% dk gray (some red) lithic fragments, clast dominated, weakly to moderately consolidated, in a carbonate matrix

 **2250 ft:** No Sample

**2290-2330 ft:** FeOx stains (up to ~0.5 cm) make up about 25% of the total rock, FeOx areas seem to be confined to certain fine grained patches, but not all fine grains

**2490-2510 ft:** FeOx spots are common, but associated to drill shavings (bit change)

**2510-2530 ft:** buff colored clay stone w/ tr py, few clear, euhedral qtz pieces found in 2530 ft

**2550- ft:** dk gray with a slight brown tint, weakly porphyritic ***basaltic andesite***, plag lathes make up ~55% of chip and are slightly porphyritic in a dk gray microcrystalline groundmass, tr py (could be drill shavings, but too brassy and non magnetic)

**2650 ft:** thin qtz on surface of some chips (vns)

**2750-3250 ft:** tr-1% qtz chips

**2770- ft:** porphyritic nature becomes less prominent

**2950-3150 ft:** tr chl, silica chip tinted teal

**2990-3210** **ft:** maroon, red chips (FeOx) make up ~35% of chips

**3250 ft:** tr chl

**3330-4350 ft:** tr-1% qtz chips, tr cal

**2870-3970 ft:** maroon, red chips (FeOx) make up ~35% of chips

**4010-4110** **ft:** maroon, red chips (FeOx) make up ~20% of chips

**4150 ft:** maroon, red chips (FeOx) make up ~35% of chips

**4430-4450 ft:** coarse grained angular ***basaltic breccia/sandstone***, few larger pieces are carbonate cemented w/ fragments of basalt similar to underlying unit, likely this is not the full 40ft of sandstone but interlayered w/ other basalt flows

**4470-6330 ft:** mod gray to slight brown tint, aphanitic gray ***basaltic andesite***, lighter in color than overlying basaltic flows, gray microcrystalline groundmass w/ few very small black specks (bt?), no larger visible crystals, silica chips are ~0.5-1.5%, tr py

**4730 ft:** about 50% of chips are a white-lt gray very fine grained ***qtz rich ash flow***, most of groundmass is qtz/flds w/ <3% bt

**TS; 4730 ft:** chips are very fine and ~50% fine grungy chips ash tuff(?), 50% basaltic andesite, Bt is 3% and likely came from ashy layer

**4790 ft:** about 65% of chips are a white-lt gray very fine grained ***qtz rich ash flow***, most of groundmass is qtz/flds w/ <3% bt

**TS; 4790 ft:** 65% of chips are fine grained, grungy ashy chips w/ Bt in the matrix (~0.25 mm long, very fine grained)

**4890-4910 ft:** lt gray weakly porphyritic, plag lathes are visible in aphanitic gray groundmass

**5050 ft:** ~30% of chips are cal and/or qtz, indicating a moderately large qtz+cal vn

**5070-5090 ft:** ~50% of the chips are a light greenish-gray, silicified? Sericite?, few chips of cal/qtz similar to those found at 5050ft, possibly downhole contamination or splays to the main vn at 5050 ft.

**5250 ft:** platy occurrence of a black fiberous mineral, softer than a pick, serpentinite?

**5270 ft:** few (~5%) of chips are weakly carbonate cemented sandstone, one occurrence is coarse grains on a small angular sized pebble, could be a breccia layer within this interval

**5290-5750 ft:** ~40-65% of the chips are a light greenish-gray, soft and fine grained, ash tuff?, qtz/cal chips are relatively common w/ 0.5-2% unless otherwise noted, tr py, chl causing slight green tint? ***Interbedded fine grained qtz volcaniclastics***

**TS;** **5370 ft:** chips are very fine, most chips are plag rich basaltic andesite, <5% are secondary minerals including cal+chl+czo, basaltic pieces have light to mod clay alteration, <20% of chips are very fine grained ash w/ some larger qtz xtls

**TS; 5470 ft:** Similar chips to 5370, clay altered and chl overprint are common

**TS;** **5570 ft:** >85% of chips are basaltic andesite, remaining 15% are fine grained qtz weakly annealed>fine grungy calcite>chl

**5570 ft:** cal/qtz hips make up ~5%

**TS;** **5670 ft:** basaltic andesite chips are about equal to ash flow with a minor amount of secondary minerals (cal+chl)

**5730-5750 ft:** ~50% (slightly more at 5750 ft) of chips are cal and/or qtz representing a vn

**5830-6330 ft:** ~40-65% of the chips are a light greenish-gray, soft and fine grained, ash tuff?, qtz/cal chips are relatively common w/ 0.5-2% unless otherwise noted, tr py unless otherwise noted, chl causing slight green tint?

**5830 ft:** intense FeOx spots, as well as common silica chips (~55%) and ~0.5% py (not oxidized)

**5850 ft:** 50% qtz+cal chips

**5930 ft:** chips are weakly carbonate cemented sandstone (~25%) w/ coarse angular grains of similar composition as surrounding units

**6050 ft:** cal vn, ~3 mm attached to wall rock

**6350-6410 ft:** white to very pale green, sugary ***quartzite***, very fine grained xtls, chips are clear to milky white w/ a pale green tint (chl) on about 25% of the chips, tr-0.5% py, A thin section (at 6370 ft) would help to better define this rock unit

**TS; 6370 ft:** most chips are >90% qtz, weakly annealed w/ minor musc, <5% of chips are cal, <5% of chips are basaltic andesite (fine xtls; most likely downhole contamination)

**6430-7010 ft:** This unit is a variable mix of dk gray ***basaltic andesite*** fragments and clear to white ***quartzite?***, basaltic fragments are aphanitic w/ few pieces having visible plag xtls, quarzt pieces are clear/gray to milky white (possibly some feldspars) w/ a sugary texture, 25% of pieces are tinted green from chl and tr ep, tr-0.5% py, chips range from 30-70% basaltic andesite and 30-70% quartzite this could be from intense qtz vns/quartz sandstone interlayered w/ basaltic andesite metamorphosed into quartzite/quartz monzonite (w/ no bt) interlayered w/ basaltic andesite, ***Interlayered basaltic andesite and meta sediments***, basalt could be sedimentrary, but doesn’t seem likely and meta seds include qtzt, marble, and tr musc schist

**TS; 6470 ft:** 60% of chips are qtz rich (>90%) w/ minor musc (?), 40% are plag rich basaltic andesite w/ ultra fine to fine xtls and have slight chl alteration, chl+cal in vugs too

**TS; 6570 ft:** plag+olv xtls in basalt make up ~15% of chips, 40% of chips are qtz/cal chips (commonly as qtz (larger grains) or cal separate but sometimes the two are juxtaposed) from a marble, 45% of chips are fine grained weakly annealed quartzite w/ some tr occurrences of musc (foliated in some chips)

**TS;** **6670 ft:** 65% of chips are calcite, likely from a marble, 25% of chips are basaltic andesite w/ very fine xtls (<0.1 mm) slight chl alt (overprint on some chips), 15% are fine grained annealed qtz grains

 **6870-6890 ft:** white qtz chips make up >85% of the chips

**END HOLE**

**Fallon F.O.H. 3 0-8950 ft:**

\*From 0-3000 ft chips are at 30 ft intervals, from 3000- ft the chips are at 10 ft intervals

**0-850 ft:** brown-buff colored subrounded fine to very coarse grained ***lithic sandstone***, clast dominated w/ ~50% qtz, 40% lithic fragments and 10% flds in a fine carbonate matrix (weak fizz w/ HCl), few intervals have some fine grained well consolidated pieces (possibly indicating interlayered siltstones)

**70 ft:** two pebble sized basaltic andesite pieces with other coarse grained clasts, possibly a breccia layer?

**250 ft:** helix fossil found 🡪

**640 ft:** tr py

**790 ft:** tr py

**880-2200 ft:** gradational contact; brown-tan colored fine to coarse grained ***tuffaceous sandstone***, ~50-60% qtz 20-25% dk gray lithic fragments remainder is tuffaceous material including white w/ ~5% bt and soft green fragments w/ very fine grained groundmass, carbonate cemented, variable amounts of tuffaceous material mixed with lithics suggests possibly interlayered in <20ft increments?

**1000-1060 ft:** all fine, siltstone w/ few (<10%) clasts are medium sized or coarser

**1630-1690 ft:** qtz rich zone, ~65% of fragments are qtz and ~10% are flds

**1810 ft:** No Sample

**1870 ft:** No Sample

**1960 ft:** tr py

**1990 ft:** tan-buff colored tuffaceous pieces make up ~80% of chips

**2110-2140 ft:** tr py

**2230-4940 ft:** brown to dk gray, aphanitic ***basaltic andesite***, microcrystalline groundmass is white to dk gray w/ some FeOx stain patches, silica chips (qtz) make up ~1% unless otherwise noted and are likely related to vesicles (rather than fractures, some pieces have a strong concave wall rock), few pieces are weakly porphyritic w/ very small, but visible plag xtls

 **2230 ft:** qtz vnlt found cross cutting one chip

**2410-2440 ft:** tr chl, commonly found as a thin layer on vesicle walls, silica chips are ~5%

**2560-2680 ft:** tr chl

**2740 ft:** cal+qtz vns

**2770-2800 ft:** No Sample

**2860-2890 ft:** ~15% of chips are a maroon color

**\*\*3010 ft:** samples are now at 10 ft intervals

**3010-3020:** qtz chip make up ~2-3%

**3030 ft:** No sample

**3080-3130 ft:** tr chl

**3160 ft:** 10-15% of chips are deep maroon

**3160-3200 ft:** tr chl, tr-2% maroon chips, 1-3% of chips are qtz

**3210 ft:** No Sample

**3230 ft:** No Sample

**3290-3300 ft:** tr chl

**3310 ft:** 5% of chips are qtz

**3420 ft:** qtz chips are much larger at this depth than seen at other intervals, about 1 mm thick and 0.5 cm

**3430 ft:** no sample

**3550-3560 ft:** qtz chips make up 2-5% of total chips, tr cal chips

**3610 ft:** tr chl

**3630 ft:** No Sample

**3640-3660 ft:** chips are mostly brown with ~15% dk gray and 10% red-maroon colored

**3690 ft:** tr chl

**375-3760 ft:** tr chl

**3830 ft:** No sample

**3880-3910 ft:** tr chl and about 5% of chips are maroon and 2% qtz chips

**3950 ft:** No sample

**4190-4240 ft:** tr chl and qtz+cal chips (~5%, w/ more qtz than cal)

**4230 ft:** no sample

**4310-4360 ft:** maroon red chips (~10-30% of chips) w/ ~2% qtz chips, slightly increased abundance of qtz w/ red chips

**4430 ft:** No Sample

**4480-4600 ft:** 1 to 3% of chips are cal w/ <1% qtz and tr chl, pieces are commonly maroon (<25%)

**4750-4870 ft:** chips are ~50% lt gray and 50% dk gray/brown, tr qtz and tr chl, coloration is the only difference between this interval and surrounding intervals and possibly suggests a more andesitic compostion

**4880-4900 ft:** qtz+cal chips make up about 3% of chips

**4950-5290** **ft:** 1-4% cal+qtz chips and tr chl, chips become progressively lighter gray to 4960 ft where light gray chips are most abundant due to silicification(?) at 5010 the gray chips (~75% of total) have a slight greenish tinge (chl?), altered chips become less abundant at 5120 ft (~40% of total), tr py rarely found at certain intervals, greenish chips appear more qtz (very fine xtls) rich than surrounding volcanics, could be a reworked tuff/silicified or Phyllic altered volcanics, ***Basaltic andesite***, altered to clays, <5% of basaltic chips have olivine, <5% of total chips are qtz+cal chips from secondary vn/vugs

**5300-5420 ft:** dk gray to brown aphanitic ***basaltic andesite***, microcrystalline groundmass is white to dk gray w/ some FeOx stain patches, silica chips (qtz) make up ~1% unless otherwise noted and are likely related to vesicles (rather than fractures, some pieces have a strong concave wall rock), tr chl, tr cal vns unless otherwise noted

**5330 ft:** about 40% are a white to light green soft, very fine grained chip (tuff layer?) that has a slight carbonate component, ~1% of chips are calcite

**5430-5680 ft:** weakly porphyritic and variably altered ***basaltic andesite***,1-4% cal+qtz chips and tr chl,, about 10-75% (gradational contact where 75% at 5500 ft) lt gray, silicified volcanic (although it is fairly soft and weakly carbonate?) with a slight greenish tinge (chl?), could be a reworked tuff/silicified or Phyllic altered volcanics, thin section shows clay and py overprint on basaltic andesite (altered plag xtls) chl is also common

 **5540 ft:** cal vn material, white w/ weak to moderate HCl rxn, thin section

 **5570-5590 ft:** tr py associated with associated qtz (<5% of chips are cal)

**5700-5920 ft:** dk gray to brown aphanitic ***basaltic andesite***, microcrystalline groundmass is white to dk gray w/ some FeOx stain patches, silica chips (qtz) make up ~1% unless otherwise noted and are likely related to vesicles (rather than fractures, some pieces have a strong concave wall rock), 1-3 % qtz, tr chl, tr cal vns unless otherwise noted

**5620; 5650; 5860 ft:** tr ep

**5700 ft:** chips are mostly purplish red

**5720-5790 ft:** tr py

**5710-5780 ft:** ~50-60% of chips are lt gray to lt green w/ <10% in surrounding intervals

**5870-5910 ft:** 5-10% of chips are cal with tr qtz

**5930-5950 ft:** 95% of chips are white ***quartzite***, tr py, chips are qtz dominated w/ fine grained xtls, thin section shows annealed qtz grains

**5960-6080 ft:** lt grey w/ a slight green tinge altered ***basaltic andesite***,1-2% cal+qtz chips and tr chl,, about 80% (gradational contact where 75% at 5500 ft) lt gray, silicified volcanic (although it is fairly soft and weakly carbonate?) with a slight greenish tinge (chl?), could be a reworked tuff/silicified or Phyllic altered volcanics, tr ep

**6020-6030 ft:** cal+qtz vn (cal dominated), where chips make up 65% and 40% of 6020ft and 6030ft respectively

**6040 ft:** one piece of wall rock has wall rock with ep followed by cal

 **6060-6080 ft:** tr py and tr chl

**6100-6510 ft:** white to translucent to very pale green, sugary, weakly annealed ***quartzite***, xtls in the quartzite are very fine, chips with green tinge have chl stain(?), about 10-25% of chips are gray to brown basaltic andesite (although petrography report says schist and xtls may be too small to see foliation, thin section), tr py often associated w/ the quartzite

**6210-6270 ft:** most chips >75% are either smoky gray quartzite or dk gray foliated bt schist(?)

**6280-6510 ft:** About 50% of chips are white/clear sugary quartzite, many of these are pale green stained by chl and have tr-05% py, and about 50% are dk gray/brown very weakly porphyritic basaltic andesite,

**6520- ft:** dk gray to brown aphanitic to very weakly porphyritic ***basaltic andesite***, Most chips are aphanitic with rarely visible plag lathes, ~1% chl covered pieces from lt to very intensity and tr py, <5% qtz/cal chips unless otherwise noted

 **6540-6550 ft:** ~10-15% are qtz+cal chips (fairly evenly split) from vns

**6600-6680 ft:** gradational increase in lt green to white colored chips from 35% to 60%, most chips react moderately to intensely, cal+qtz vns/breccia, tr py associated w/qtz+cal pieces, thin section

**6740-6760 ft:** 60-70% of chips are white to lt gray/green, white chips are very fine xtls w/ ~5% microcrystalline bt, at 6750-6760 ft bt still exists however the surrounding qtz + flds(?) is now altered w/ chl and stained green

**6790-6800 ft:** <1% cal vn + tr ep > tr py

**6860-6940 ft:** lt colored chips are most dominant, most commonly light colored chips are pure qtz (60-65%), either as translucent white or clear (most commonly at 6940 ft and commonly will be euhedral in shape, other milky white cal pieces have a strong HCl rxn (~10-20%), ~15-20% of the chips are dk gray to brown and can have a weak to moderate foliation (especially seen in the brown pieces, gray to smoky pieces are possibly quartzite, but certainly some pieces at this depth are basaltic andesite from uphole contamination), <5% of chips have a slight chl stain, tr chl, ***meta-sediments🡪interlayered quartzite, marble, schist***

**6880 ft:** micas/bt present in a slightly more gray rock than surrounding unit, xtls are still very fine grained, some pieces show plag lathes, some pieces have pale green overprint (chl) indicating alteration

**TS;** **6890 ft:** qtzt w/ siginificant clay alteration making chips appear grungy, all chips are the same

**TS; 6940 ft:** ~50% of chips are fine weakly annealed qtzt chips and about 50% calcite chips, rarely is calcite juxtaposed w/ qtz although these pieces do occur infrequently, less overprint alteration at this interval than 6890

**6950-6960 ft:** lt to dk gray, red, green and brown aphanitic altered ***basaltic andesite***, all pieces are fine xtls making up a groundmass, green pieces (from chl overprint) make up about 25% of pieces, <1% of pieces are cal+ tr py vns, tan/brown pieces are granitic w/ mostly qtz, some flds, and <5% bt

**6970-7020 ft:** white to lt gray ***qtz marble***, violent HCl rxn w/ all pieces although a significant amount of qtz (pick wont scratch these pieces) remains after rxn is complete, thin section shows mostly cal rich pieces w/ <10% qtz

**7030 ft:** No Sample

**7040-7310 ft:** interlayered ***quartzite and altered basaltic andesite***, abundance of each type ranges from 25-75%, white/gray quartzite chips w/ very fine xtls weakly annealed and tr py commonly associated with the quartzite, other chips are pale greenish-gray to dk gray w/ brownish chips are basaltic andesite w/ slight chl overprint, some chips are weakly porphyritic w/ plag lathes, clay alteration is present, thin section

**TS; 7090 ft:** chips of calcite w/ ep inclusions, seems like Ep formed broke away from vn/vug wall then calcite formed surrounding ep xtls, ~50% qtz grains weakly annealed w/ slight clay alteration, ~50% weakly altered basaltic andesite

**TS; 7200 ft:** Similar chips as 7090 ft w/ ~65% basaltic andesite and ~35% qtzt, calcite found in void spaces of both lithologies, tr resorption texture qtz suggests this layer is ***interlayered basaltic andesite and quartzite w/ tr ash flow layer(s)***

**TS; 7310 ft:** acicular opaque mineral in calcite vn (sulfide?)

**7230 ft:** No Sample

**7310-7950 ft:** semi translucent pink to green forms a matrix with clear glassy qtz and a white elongate mineral (no rxn, plag?) clasts, ***ash flow tuff***  (altered?), light HCl rxn from cal vns (tr throughout section), commony white quartzite pieces exist and could likely me interlayered in this section, tr py, thin section (petrography report calls this ash flow tuff)

**TS; 7390 ft:** Ashflow tuff, qtuz has resorption textures in very fine grained grungy groundmass, <15% of chips are basaltic andesite (down hole contamination?)

**TS; 7480 ft:** Similar as 7390 ft, chl in void spaces, fine grained ash flow w/ porphyritic xtls (microcline and resorption qtz)

**TS; 7600 ft:** chl alt and vn qtz is common, where chl patches seem bound to relict xtl boundaries (qtz? Fld?) in ash flow

**7630 ft:** No Sample

**7650-7680 ft:** In addition to ash flow pieces (?) ~40% of chips are altered silicified/altered basaltic andesite dike (?) w/ plag lathes visible plus significant chl overprinting, thin section

**TS; 7680 ft:** Lithic tuff, ~40% plag rich lithic fragments w/ chl alteration and tr py, ~60% of chips are ashflow tuff w/ cal in voidspaces and some fine altered annealed qtz xtls forming a grungy groud mass

**TS; 7770 ft:** few lithic fragments, altered, remaining pieces are all fine grained ash, not densely welded as xtls do not appear deformed

**7830-7850 ft:** 30-65% of chips are altered granite w/ fine to medium grained euhedral plag xtls and greenish (chl) overprinted translucent anhedral qtz and ~10% very fine bt xtls

**7850 ft:** very fine grained euhedral, clear qtz xtls (from a vnlt?)

**TS;** **7870 ft:** 70% of chips are lithic (basaltic andesite w/ fine plag xtls), few are fine grained ash, ***basaltic andesite*** flow/dike layer w/in a greater ash flow tuff

**7910 ft:** No Sample

**7920 ft:** chips are covered with an orangish tan fine grained sediment, likely drillers mud

**7930-7950 ft:** About 35-50% of chips are weakly porphyritic basaltic andesite (interlayered lava flows and ash flows?)

**7960-8660 ft:** white to clear/gray w/ very pale green/purple mottled patches uncommonly in an ***ignimbrite***, some chips have moderately porphyritic clear, glassy qtz w/in a quartz rich matrix, also existing as ‘porphyritic/clast” is dk green/gray pieces, ~5% of chips are white calcite (strong HCl rxn, where surrounding qtz chips do not react), few darker chips in this interval appear to be silicified, tr-1% py, variably altered basaltic andesite pieces make up <10% (probably downhole contamination) unless otherwise noted

**TS; 7979 ft:** Fine grained w/ some porphyritic xtls (flds) w/ significant alteration, some cal from vns (<5% of chips), groundmass is ashy

**8040-8190 ft:** 45-65% of chips are variably altered dk gray-green andesite, w/ silicification and chl blotches covering most areas, plag lathes are common

**TS, 8100 ft:** Heavily altered basalatic andesite w/ ep (?) in groundmass, plag lathes in basaltic andesite are variable in size but exist in all chips

**TS; 8190 ft:** ~50% ashy tuff and ~50% altered basaltic andesite (py+clay), few pieces are cal+ep from a vn, one qtz vnlt seen, <5% are fine grained qtz annealed w/ interstitial cal

**8230 ft:** No Sample

**8270-8370 ft:** 15-30% of chips are variably dk gray-green altered andesite, w/ silicification and chl blotches covering most areas, plag lathes are common

**TS; 8290 ft:** Fine grained qtz grains w/ <5% grains beign larger (>0.1 mm), alteration has left this grungy ***quartzite***, ~35% are basaltic andesite w/ some alteration, tr musc found in qtzt

**TS; 8300 ft:** fine grained qtz rich ashy tuff w/ porphyritic xtls including resoption qtz, musc and plag w/ cal+czo altartion, ~30% of chips are altered basaltic andesite w/ tr py+tr chl, lithic tuff?

**TS;** **8350 ft:** ep+cal/qtz vns in ash flow w/ xtls (flds+qtz) that are porphyritic in very fine grained, qtz rich, grungy groundmass, chl alteration on lithic fragments

**8400-8440 ft:** 15% of chips are variably altered dk gray-green andesite, w/ silicification and chl blotches covering most areas, plag lathes are common

**TS; 8440 ft:** >75% of chips are fine grained qtz weakly annealed but also grungy, very few larger xtls, qtz-rich weakly welded ash flow tuff, ~25% of chips are basaltic andesite w/ alteration (chl+tr py) possibly down hole contamination

**8430 ft:** No Sample

**8520-8660 ft:** 40-60% of chips are variably altered dk gray-green andesite, w/ silicification and chl blotches covering most areas, plag lathes are common, seems to be a gradational contact to an area where basaltic andesite is the dominant lithology (>80%)

**TS; 8570 ft:** 65-70% of chips are basaltic andesite w/ chl+py alteration, <30% of chips are fine grained qtz rich ashy tuff, several cal chips from vns

**TS; 8650 ft:** ~50% basaltic andesite and ~50% ash flow tuff,

**8670-8690 ft:** greenish gray variably altered (mod-intense) aphanitic ***basaltic andesite***, certainly most chips have significant silicification and chl overprint, weakly porphyritic plag lathes in some pieces, few qtz chips from vns, tr py

**8700-8790 ft:** Most chips are white to translucent clear, pure fine grained qtz crystals (very fine grained but appear possibly annealed) ***ashflow tuff***, weakly annealed suggesting weak welding, tr py occurs w/ qtzt, very few chips react w/ HCl (tr cal vns?), about 20% of the chips are altered basaltic andesite likely representing some downhole contamination but possibly also interlayered lava flows, especially at the most uphole contact, chl alteration seems to be constrained to only the volcanics, where qtzt is too pure for chl alteration

**TS; 8760 ft:** 15% of chips are basaltic andesite w/ fine plag lathes, ~85% of chips are very fine grained ash tuff, very grungy (clay alteration?), slight chl alteration

**8800-8880 ft:** greenish gray variably altered (mod-intense) aphanitic ***basaltic andesite and interlayered ash flow***, certainly most chips have significant silicification and chl overprint, weakly porphyritic plag lathes in some pieces, few qtz chips from vns, tr py, gradational contact at downhole to qtzt

 **8830 ft:** No Sample

**TS; 8860 ft:** <10% of basaltic andesite chips w/ some clay/chl alteration (down hole contamination), remainder of chips are fine grained ash flow tuff

**8890-8950 ft:** clear gray very fine grained ***quartzite***, <3% of rock is chl blebs amongst very fine, weakly annealed (?) quartz xtls, some chips are mottled lt purple/green (could be silicified basaltic andesites, increase in frequency from 8920-8950 ft), 20-40% of chips are altered basaltic andesite

 **TS; 8950 ft:** 40% basaltic andesite, 60% ash flow tuff, confirms this whole section (5930-8950 ft) are interlayered basaltic andesite and ash flow tuff w/ minor layers of meta seds (qtzt/marble/schist)

**END HOLE**