Prospect Geotech
Reno, Nevada
505-228-6690

Akutan Hot Springs Bay #3

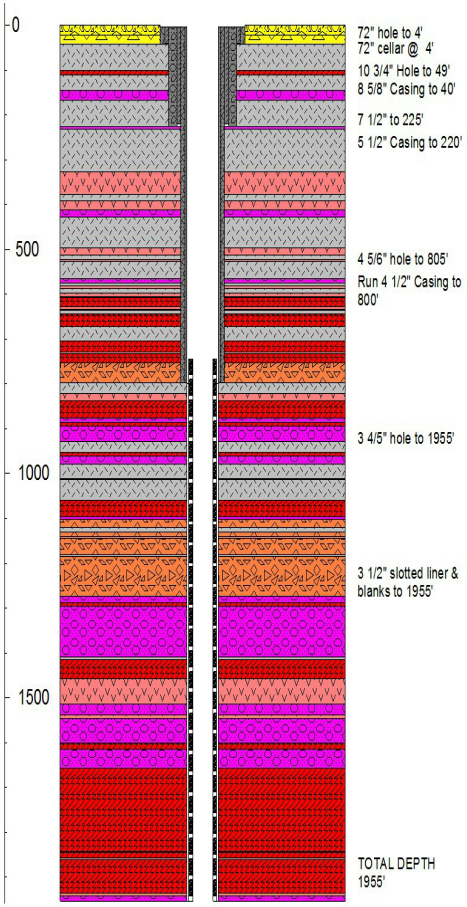
ABBREVIATIONS

NB	New Bit
RRB	Re-run Bit
CB	Core Bit
WOB	Weight on Bit
RPM	Revolutions per Minute
PP	Pump Pressure
SPM	Strokes per Minute
POOH	Pull Out of Hole
WR	Wiper Run
LAT	Logged After Trip
LC	Lost Circulation
NR	No Returns

Lithology Symbols

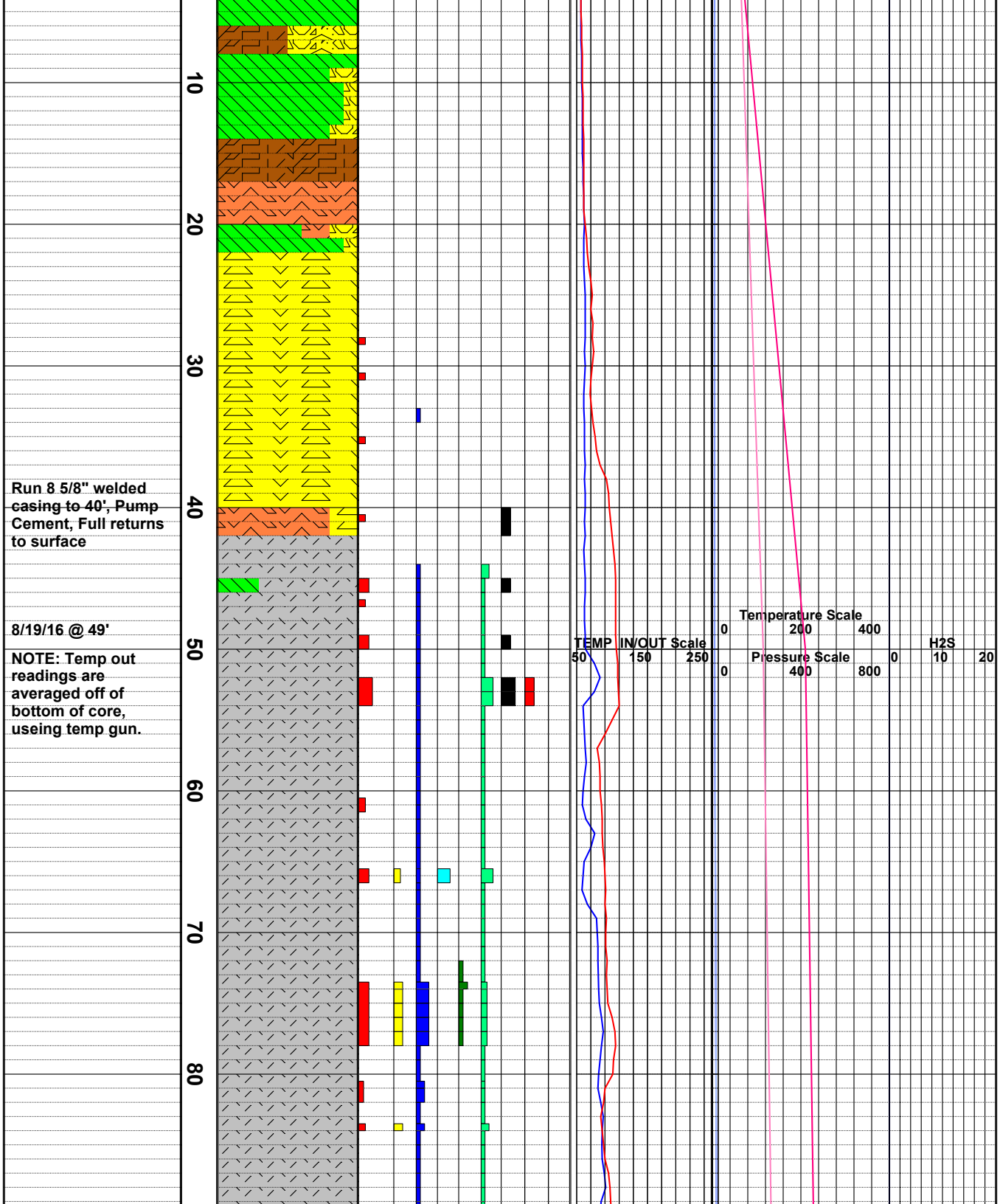
- Clay
- Lahar
- Basalt
- Andesite
- Gabbro
- Glacial Till
- Lithic Basalt
- Scoria/Cinders
- Volcanic Breccia
- Hyaloclastite
- Tuff

WELL CONSTRUCTION



COMPANY:	City of Akutan
WELL NAME:	AK-3
FIELD:	Hot Springs Bay Valley
COUNTY/STATE:	Akutan Island, Alaska
COORDINATES:	Lat N 530976.68 Long W 55919.03
ELEVATION/KB:	41' GL 46' KB
API NUMBER:	50-20005-00-00
COMPANY REP:	Monty Keown
CO. GEOLOGIST:	Mary Mann
CONTRACTOR/RIG:	Major Drilling
SPUD DATE:	8/18/2016
LOGGING DATES:	8/18/2016 to 9/5/2016
LOGGED DEPTHS:	4 ft - 1955 ft
LOGGING GEOLOGISTS:	Blake Bundy
MUDLOGGERS:	

Depth	LITHOLOGY	Fractures	SECONDARY MINERALS (Quartz, Calcite, Pyrite, Epidote, Chlorite, Hematite, Zeolites, Anhydrite)	TEMPERATURE (50–250; Temp In 50–250; Temp Out 50–250)	PPS Pressures / PPS Temperatures (Pressure, Temperature; MRT Temperature 0–400)	GASES (H2S ppm 0–20)	DESCRIPTIONS
0							NOTE: Commence drilling on 8/18/10 @ 1200 hrs, from 4' cellar depth (previously dug) w/ 3 1/2"core



tube (PQ) & 4 5/6 core barrel. All depths are referenced from ground level and per driller's pipe tally.

Clay/Scoria/Till: med brn to drk brn, v sft to mod firm, fn-crs grain size, occ peb to 10 mm, sbrnd-ang, prly-mod consol, tr qtz grains, com scoria, alt layers of clay & glacial scoria till deposits, @ 20' clasts incr in size to 20 mm in milky wht layer, @ 22' clr chng f/lt med gry to overall drk blu clast filled breccia.

Breccia/Lahar: overall drk med blu - med gray, v multicol of wht, red, grnsh, gray, purplish, brown & lt - v dk gry, sl indurated, v poor sorted, dom 5-15mm clasts, com clasts up to 45mm, rr clasts up to 120mm, mostly andesite to andesitic basalt, tr FeOx stng of frac surfaces, occ flow tex throughout, transition zone @ 40-42' w incr FeOx staining, frac & crumbly, contact @ 42'.

NOTE: The Lahars and Volcanic Breccias are being distinguished by their clast sizes. Lahars being smaller in clast size, Breccias having clasts larger than 10mm.

Andesite: med - dk grnsh gry blu, redish gry, sl mottled in appearance, com speckled w/ white porphyritic altered plagioclase, crypto-microxtln, sl chloritic alteration of groundmass, occ grn chlorite along frac surfaces, com silver dipyramidal euhedral microxln cyrstals along frac planes, @ 52-54' grnsh gry, drk blu, dom clay filled, brittle, com hematite stng, magnetic in part, com chlroite alt, tr milky wht zeolites?, tr mico euhedral pyrite.

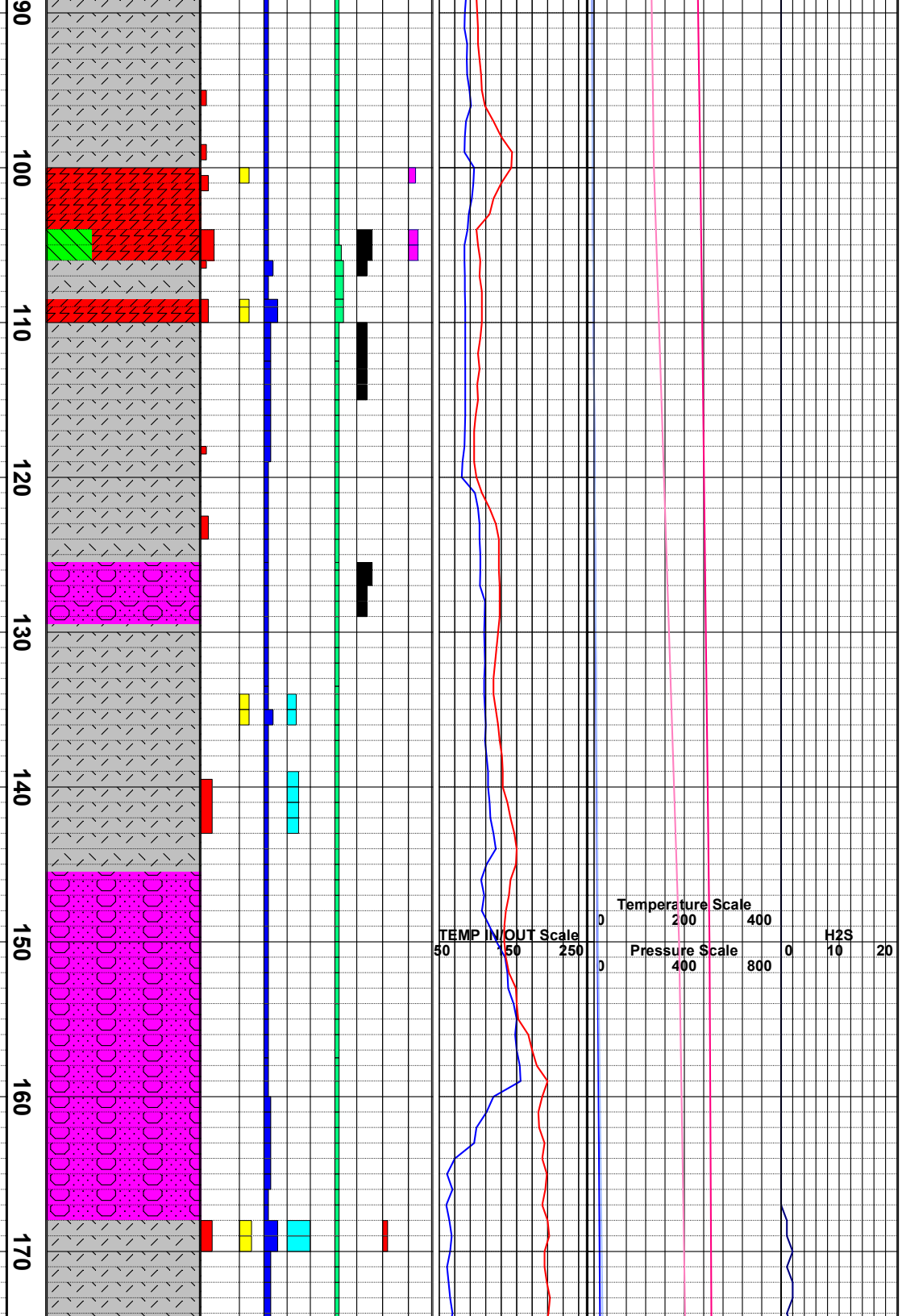
Andesite: overall drk grnsh gry to drk blush, speckled, mottled appr, ~60' 3-5mm milky wht subhedral feldspars, tr red lithics up to 30mm, tr calcite veining, @ 66' flow texture w/ alternating FeOx and chlorite layers ~0-5° horizontal to well, Incr in xlt size @ 73.5'-78' frac zone w/ subhedral epidote xlts up to 2mm, radiating milky wht calcite w med grn 2ndry growth rings, com chloritie alter of grndmass throuout, 10 mm horizontal milky qtz vein @ 76', decr wht felds and inrc blk magnetite @ 85'.

Andesite: grnsh gry, mottled tex, cryptoxln to microxln, abt milky wht subhedral to euhedral feldspar laths dom ~1mm in size, tr calcite veining up to 1mm thick, homogenus, @ 96' prob flow margin, tr

Temp spike due to core being in hole longer 144°

NOTE: Drill to 159', kill mud pump, pull core tube, well kick, high temp out = 190°, heating belived to come from 139.5'-143' permeable /fracture zone.

8/20/16 @ 165'
NOTE: While pulling core tube from 171'-176.5' core run the core tube filled with 171'-176.5' core blew out from well without rig assistance.



slickens, slt light in clr, @ 99' abt clay/anhydrite content in frac core smpl, diss euhedral pyrite (microxln), weakly calcareous.

Survey @ 99' = 0.5°, MRT = 190°

Andesite: gen a/a, @ 101' & 101.5' clay/anhydrite filled fracs 5-15mm wide w/ horizontal orientation, @ 104-106' drk brn w/redsh hue fn grained clay/anhydryite zone, f/106'-108.5' pred solid core smpl w minor smpl breaks along calcite veins, f/108.5'-110' overall drker grn gry in clr, incr in calcite veining & 2ndry mnls, finer graind xls than above and below, prob transition zone between flows, f/110'-115.5' cryptoxln, com milky wht euhedral feldspar laths, com 2ndry hematite alt, com subrnded amygduals w/ chlorite riming up to 3mm containing milky wht calcite, com calcite veins.

Survey @ 129' = 0.5°, MRT = 144°

Lithic Basalt: dom redsh to drk grnsh w/ lithics composed of basalt & andesite up to 45 mm gen 5-20mm, tr calcite veining, flow tex @ 129.5' contact zone w/ 45° angle f/horizontal.

Andesite: @ 135'-136' ~65° angle on 30mm 2ndry vein composed of druzy qrtz, calcite, eudhreal pyrite, w/ voids up to 15mm, frac,veining @ 139.5'-143' highly 2ndry altered, w/milky wht druzy euhdral qtz, com vis pyrite veining up to 0.5mm, slt chloritic alt, com calcite, voids up to 50mm wide w druzy clr qtz xls.

Lithic Basalt: clr change @ 145.5' f/lt med gry to drk gry homogenus throughout 145.5'-168', tr calcite veining, slt com lithics composed of surrounding andesite and basalt material.

Andesite: Highly alt zone f/168'-170' overall lt gry w abt horizontal to 10° oriented veining composed of dom pyrite and occ qtz, subehudral xls, occ vugs, @ 169' lrg mnlized horizontal milky wht calcite vein w euhedral xls up to 3mm,(core split in this area prob lrg cavity, full core recovery recorded).

8/21-23/16 @ 176.5'

180

190

200

210

220

8/24-25/16 @ 225'

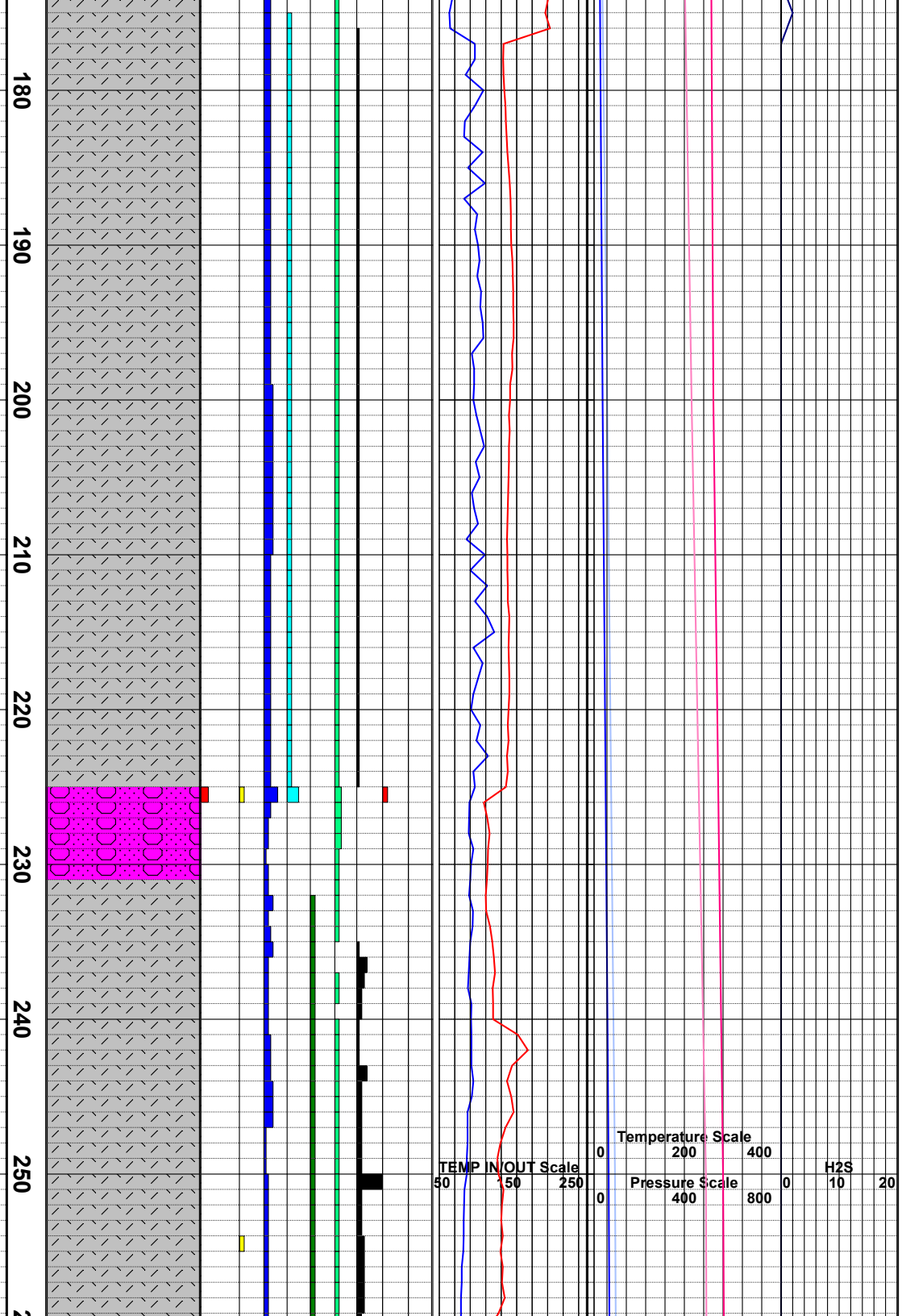
NOTE: Temp out readings from probe @ end of 15' flow line, Temp in readings from probe in mud pit, taken on time intervals & correlated to depth.

230

240

High temp out = 264.5° F

250



NOTE: Drill to 176.5', Well flashing and steaming on its own, Pump 2 cement plugs, open hole with 7.5" hole opener, Drill ahead to 225' with hole opener (no core samples f/176.5'-225'). Well losing and gaining minimal fluid, noticable but not measurable, approx 5-25 barrels

NOTE: up to 40% cement in sample @ 150' & 160' while drilling out cement. Samples free of cement @ 180-190' sample. fn - med size sand cuttings f/160'-220'.

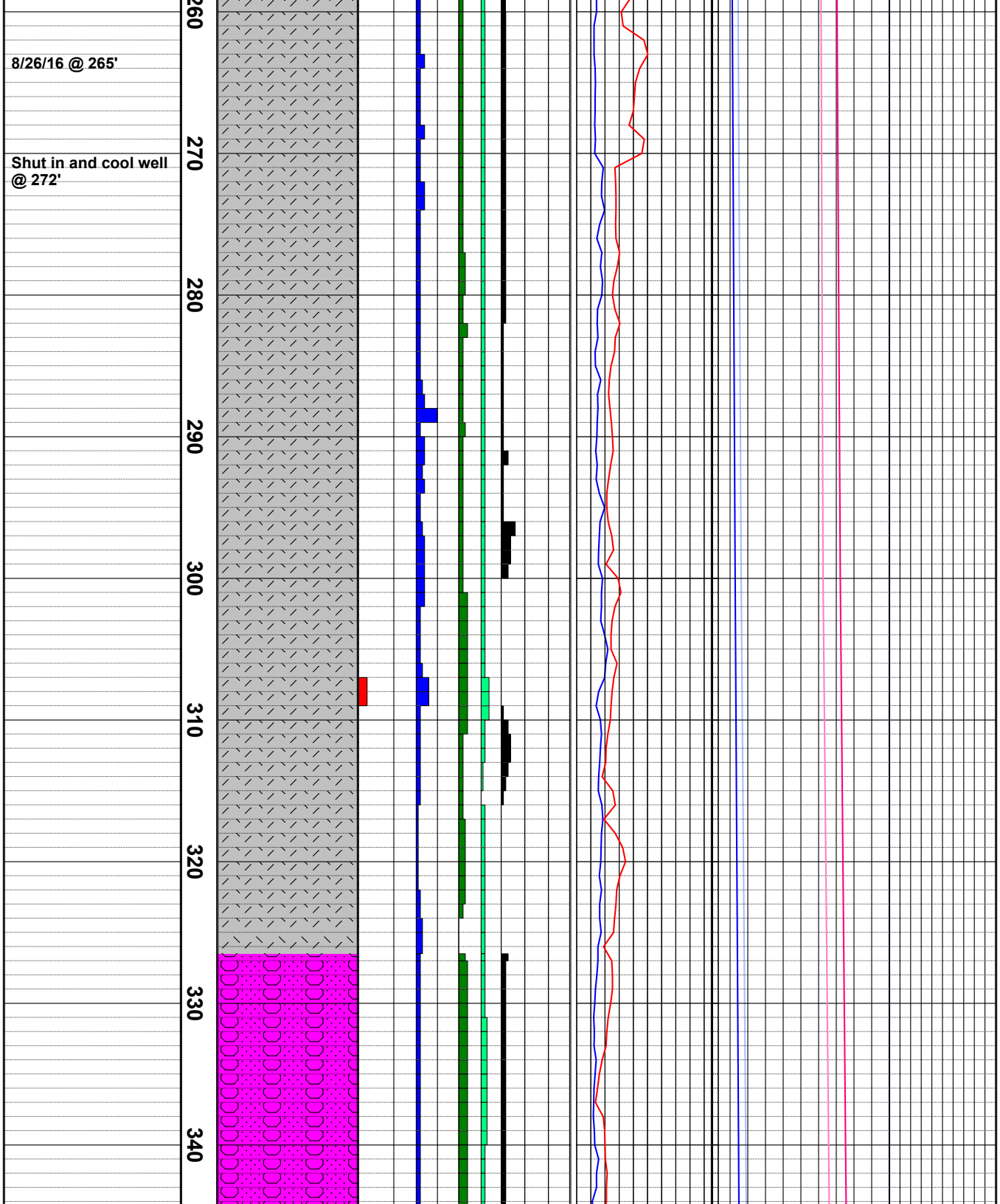
Andesite: mod to drk gry, mottled, mod com lt-med grn translucent alt feldspars/quartz mnls, less than 0.25mm size lt grn concentric crystal filled vugs, rr to tr diss pyrite throughout, tr hematite stng, com chlroite alt, v com drk gry magnetic cuttings, rr anheadral epidote, mod rec to 10% HCL solution.

NOTE: Open hole f/4.835" to 7.5" to 225' BGS. Run 5.5" casing to 220', Install BOPE. Core ahead.

Survey @ 200' = 0.75°, MRT = 140°

Lithic Basalt: overall med-drk grn, com wht calcite specks throughout, minor frac and open vug zone f/225' to 226', open vugs up to 10mm, 3-8mm calcite vein/frac, gen flow angle ~40-45° f/horizonal, com diss pyrite veining and flow tex, grading into a lithic rich chlorite alter mass wasting deposit, @ 229' slt clr change into drkr gry grn w/ slt smaller lithcs than prev, prob flow contact or less alter from frac described prev, @ 235' horizontal calcite vein 4mm thick, @ 236' abt hematite stng appr overall redsh w/ grn hues, absent veining and frac f/ 236' down.

Andesite: med gry to drk gry, speckled tex, dom solid core, slt alt with hematite 243'-244', v minor calcite veining up to 1mm, slt chlorite altered throughout, @ 254.5' lt grn fn grained layer 55-60° f/ horizontal prob ash layer?, 2ndry alt?, dike?, no chng in lithology above and below layer. possible flow boundry @ 257'



w/ incr lithics w/ depth.

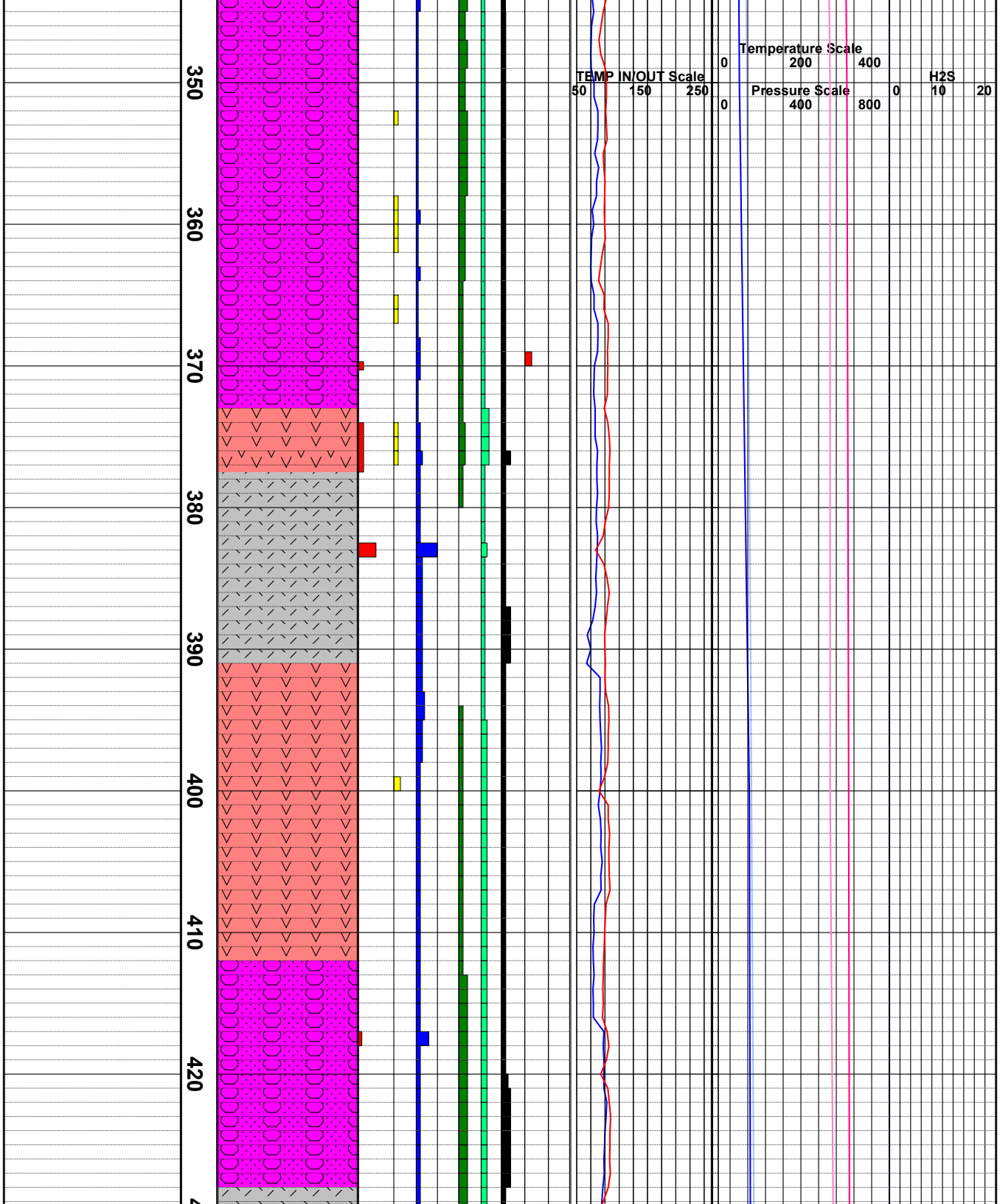
Andesite: med to drk gry grn, dom solid with few breaks in core when pulling out of core tube, com milky wht feldspar w/ slt 2ndry alteration up to 3mm, occ lithics up to 5mm, strg mag properties throughout, mod dense scratches w/ probe, slt rec w/ HCL throughout.

Andesite: med gry to drk gry, grsh hue throughout, overall speckled appr, com macroxln, dom solid core, @ 290' slt crumbly wk w incr in calcite, flow structure absent, @ 296' clr chng w/ incr in hematite stng, 298'-300' incr in calcite veining, com chlorite alt throughout w, gd tr - com drk grn concoidial frac anheadral epidote throughout samples, mod rec to HCL.

Survey @ 300' = 0.25°, MRT = 228°

Andesite: gen a/a, @ 307'-309' fracture zone, euhdral transparent w slt wht hue calcite xls up to 10mm @ 308.5', w horizontal orientation. f/311' - 313' stng hematite alteration, slt flow structure appr @ 318'-323', elogate streched alt epidote xls.

Lithic Basalt: @ 326.5' gradual contact w/ lithic rich volcanics, FeOx stng @ contact area (326.5'-327.5'), solid core, no fracs, tr flow banding @ 331' w/~5° orentation, overall grnsh gry (dry), lithics pred lt grn in clr, up to 25mm, gen 2-4mm, drk grn anheadral concodial frac epidote xls, com drk grn micro vug fill (nontronite?), wk rec to HCL.



Lithic Basalt: gen a/a, dom 5-10 mm lithics w same composition as surrounding rock, com milky wht felds, rr calcite veining, @ 370' v fn micro radiating acicular milky wht xls zeolite & rr micro botriodial 2ndry qtz along ~50° veining between core runs.

NOTE: Loseing mud to hole ~ 375', ~400' Losing around 7 gal/min

Tuff: f/374'-377.5', drk grn-gry, fine grain, dom mafic comp, cryptoxln, possible flow tex? (prob bit gen), calcite veining throughout, tr 2ndry qtz veining, wk to non- magnetic, dom non calc unless vein, abrubt contacts above & below layer on ~10° plane.

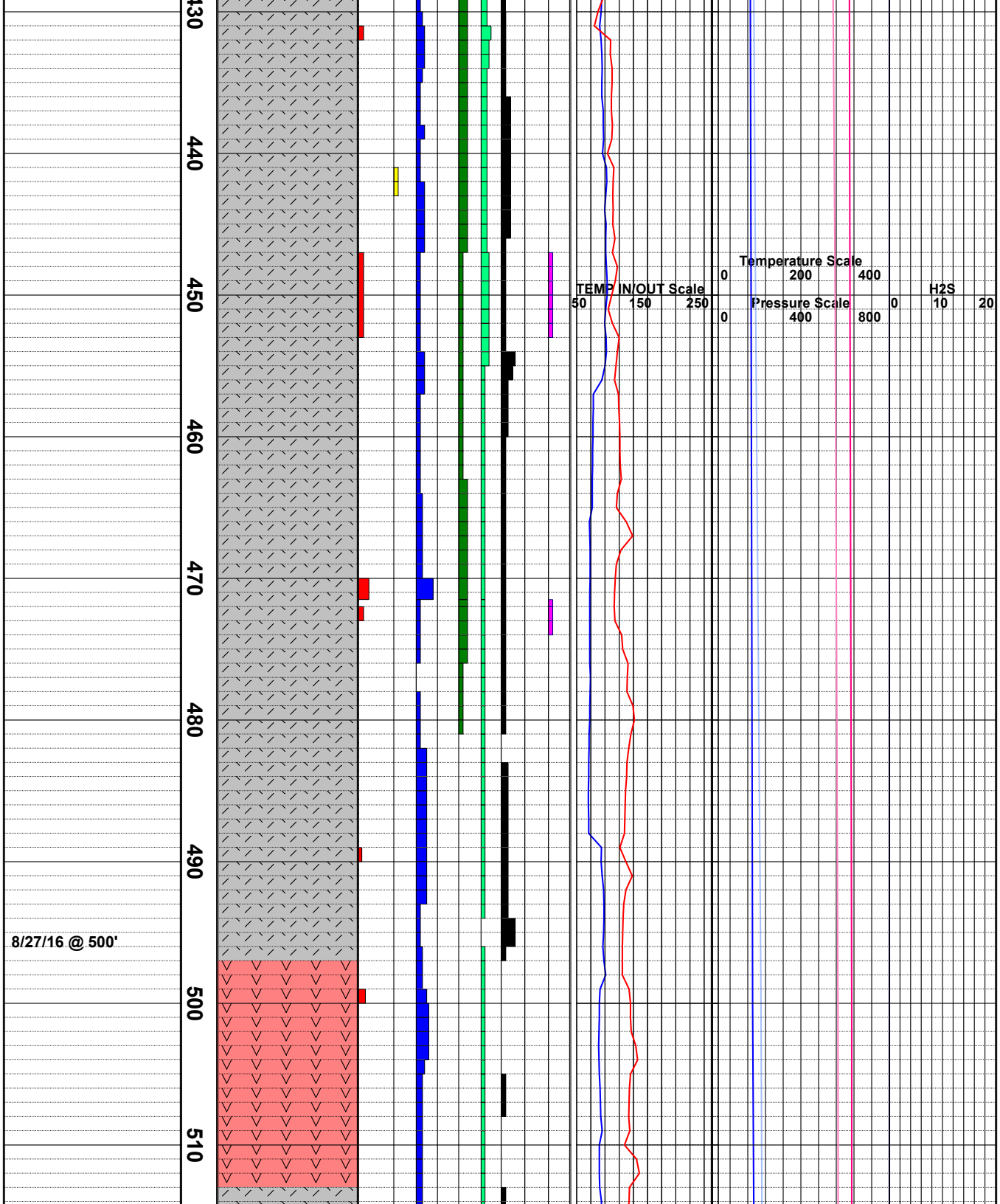
Andesite: drk med gry grn, macroxln, com speckled appr, com wht felds throughout, gd tr calcite veining, lrg calcite frac @ 383' core split unknown how lrg reported full recovery, @ least 110 mm, 45° oreintation, dom cacite comp with slight chlorite alt, same lithologys above and below zone, prob the loss zone, incr in hematite alt f/388'-391'

Survey @ 400' = 0.25°, MRT = 288°? (broke)

NOTE: Contine losing mud to hole ~7-10 gal/min

Tuff: f/391' - 412' med grn gry, cryptoxln, slt to stng magnetic throughout, contact @ 391' is sharp with ~10° orientation with no break in core smpl, com grn circular mnl (prob nontronite vug fill), slight crumbly near 405', mottled tex. slt to no rec with HCL, tr 2ndry milky qtz veining f/398'-400' w/calcite.

Lithic Basalt: med grn to gry, com lithics throughout up to 10mm, gradational contact zones, @ 417' small to med frac w/ calcite vein spliting core with euhedral xls ~5° orientation, com mag rec w/ probe, slt-no rec w/HCL.



Andesite: moderate gry to greenish gry, aphanitic, com milky plag xtls and laths, crypto grndms, f/432-434' slt chng in tex bec more deformed from chlorite alter/heat & calcite veining, f/431'432' vertical crack in core w/ tr amounts of slicks (running horizontal) and v thin layer of fault gouge when rubed between fingers clay like feeling (micro faulting), @ 434' transition zone to more defined ahnedral xls w/ depth, v rr greenish yel olivine xtls on pyroxenes, cont tr calcite veins, groundms gen non calc xls bec more anheadral w depth.

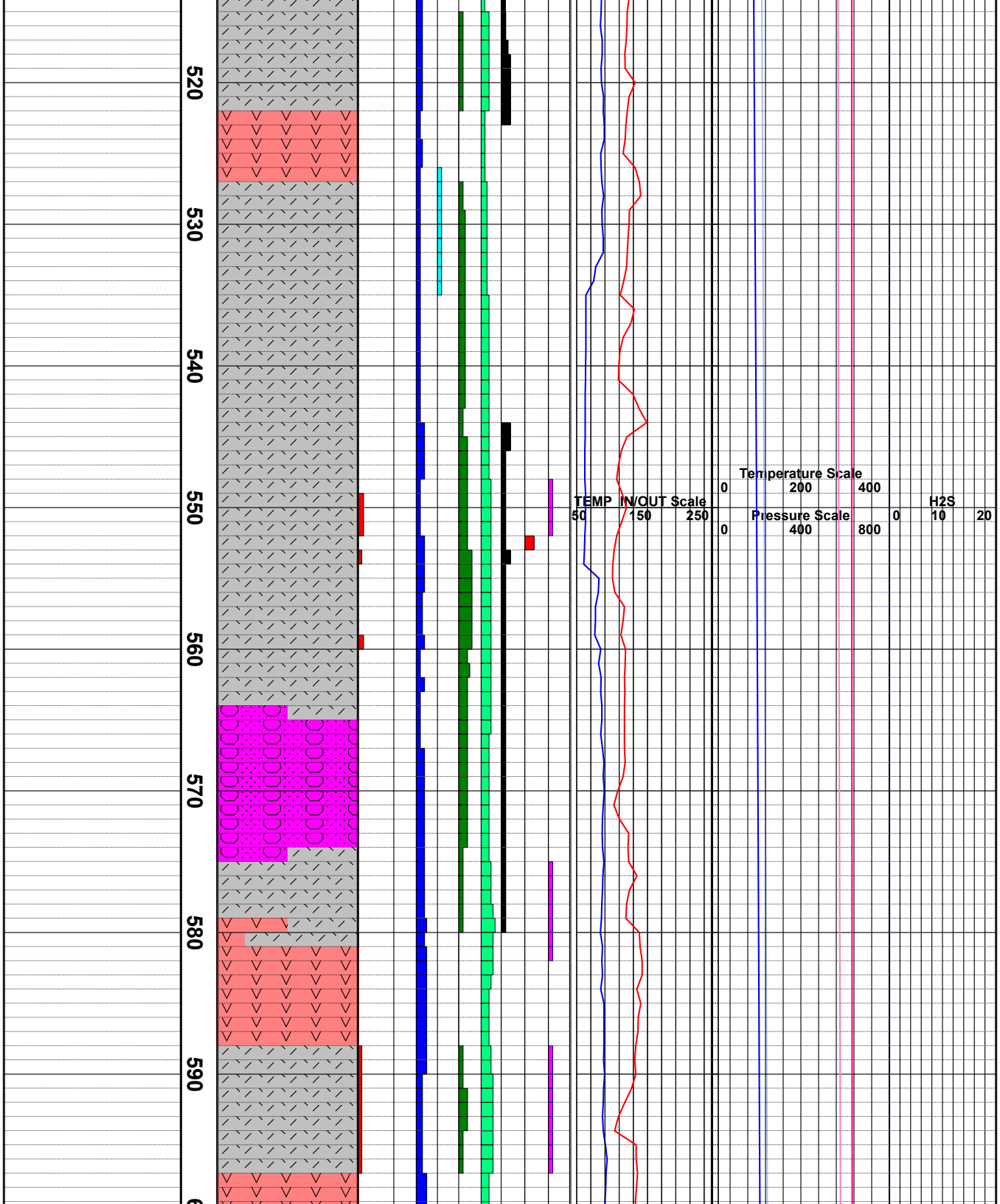
Andesite: f/447'-453' micro faulting throughout this zone dom chlorite alt w anhydryite along surfaces, tr slickenslides w/ dusting of smooth powder material felt between fingers, com drk grn concoidal frac epidote xls, tr amounts of calcite along planes, rr qtz, f/453'-459' macroxln, lrgr xls appr in this zone, com milky wht feldspars, occ epidote, @ 459' flow band ~45° orientation w/smaller xls w/depth, @ 463' lrg xls appr w/ abt epidote xls up to 5mm, com wht calcite specks, com black vitreous mnl (magnatite?), stg mag throughout.

Andesite: f/470'-471.5' lrg open frac filled (~70° orientation) with euhedral calcite (up to 10mm)and fn mlky wht transparent acicular radiating mnl (zeolite?) v rec to HCL, f/473'-474' ~1' veritical crack in core (poss fault?), drk gry grn overall, macroxln, com wht felds up to 3mm, v minimal calcite veining w/ veins 0.25mm, wk to mod chlorite alt, dom solid core w/full recovery.

Andesite: drk gry grn w/ hue of red, macroxln to 482', transitioning into melted squeesed looking xls/flow tex, mod calcite veining f/482-485', ~90mm microxln lithic w/chlroite rim @ 492' & com calcite veining, transtioning into macroxln hematite alt zone to 496', @ 497'-504' microxln lt grn gry mod dense (scrachable w/ probe) tuff appr, with ~75° depostion angle @ top of zone, grad chng into lrger xln (middle of tuff?).

Survey @ 500' = 0.25°, MRT = 250° F

Tuff/Andesite: med gry grn, cryptoxln, homogenous, plain, f/504-509' blk & wht mottled tex, blk prob mag, tr flow tex throughout, 2ndry calcite veining thoughout w/chlorite alt along veins, @ 514' xlt size incr up to 5mm w/epidote appr, rr dis pyrite, alt anheadral felds, @ 522' sharp contact with underlineing tuff.



Tuff: f/522'-527' med gry grn, cryptoxln, v plain, rr-tr specks of wht calcite, micro fault @ 522' sharp contact has ~15° bedding plain w/ 5mm offset of micro fault through bedding plain w/ ~80° orientation of fault plain, tr 2ndry calcite along micro fault.

Andesite: macroxln, speckled, mottled tex, occ diss pyrite, com milky wht felds w/subrnded appr up to 3mm, tr-rr calcite veining ~1mm, melted squeezed appr f/534'-535'.

Andesite: tr calcite veining threw 554', med to drk gry w hues of FeOx stng, tr frac w/ heavy chlorite alt & calcite along fracs, tr macroxln epidote up to 5mm, mottled xln tex, groundmass has slt rec to HCL.

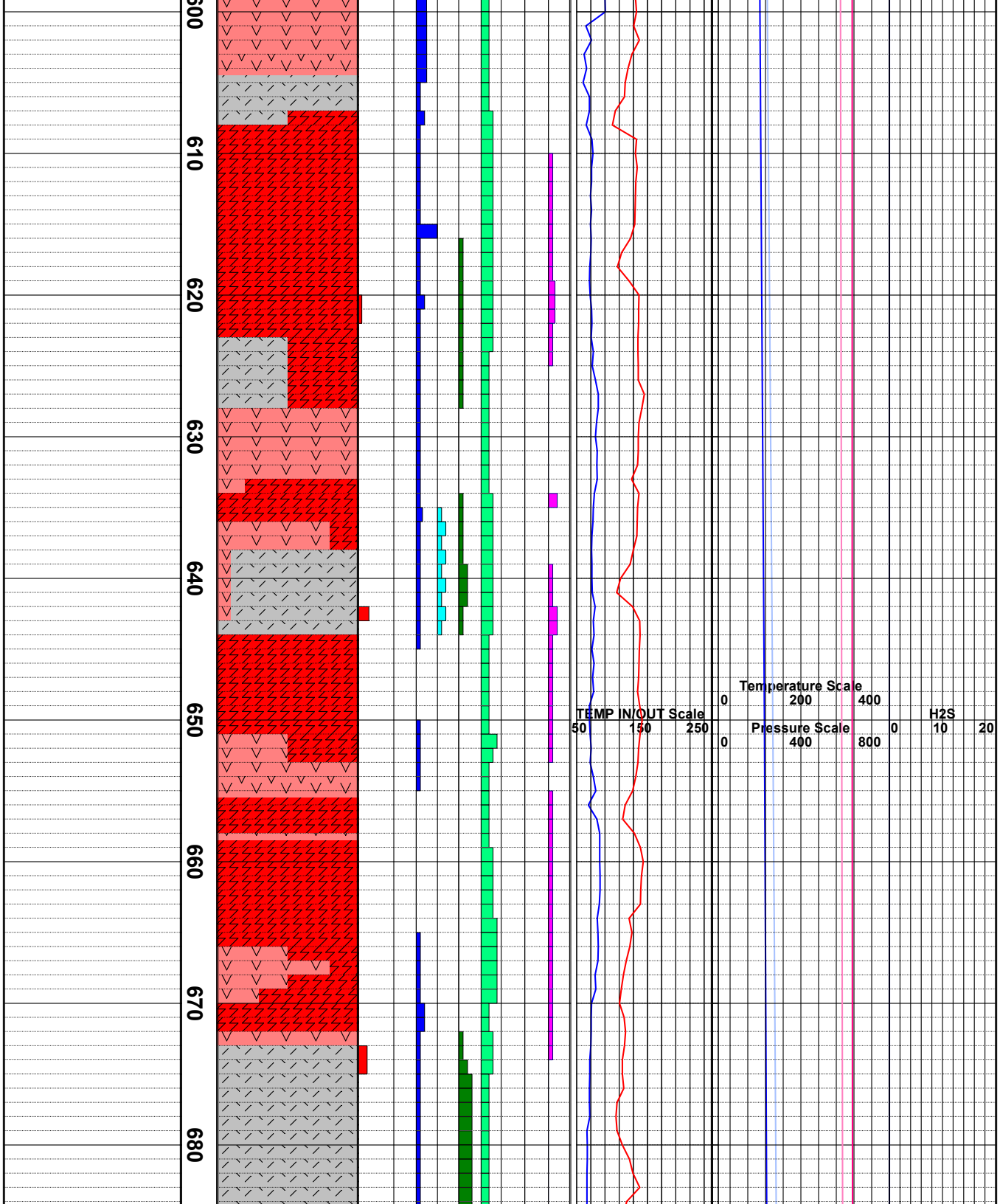
Andesite: f/553-554' abt FeOx stng along 2 horizontal calcite frac/veins, euhedral clr acicular zeolites up to 4mm, f/554'-564' v com vugs w/ drk grn epidote within, tr acicular radiating epidote in vugs w/ open cavities, vugs up to 5mm, bubbly appr, com calcite throughout.

Lithic Basalt: dom grn gry, subrnded wht, gry, drk gry, lithics, up to 30mm lithics, tr calcite veining, top contact is v gradational, while bottom is somewhat sharp ~80° orientation w/calcite veining & 2ndry chlorite alt along contact, solid core throughout contacts.

Andesite: f/575'-580', med grn gry, mottled/speckled appr, v com milky wht felds throughout up to 3mm, tr calcite veining, greasy waxy feel (anhydrite) along frac planes, v com chlorite alt, overall grndmas has slt rec to HCL.

Tuff: 579'-588', pl grn to lt grn gry, v sporatic calcite spheres (2ndry vug fill), up to 5mm, microxln, overall dom plain looking, contact zones have abt chlorite alt, contact @ 588' has 45° orientation.

Andesite: f/588'-597', med to drk grn gry, slt fractured alt zone, com chlroite, calcite, & anhydrite along micro fracs, greasy vitreous tex along fracs, dom less than 1mm in size.



Survey @ 600' = 1°, MRT = 280° F

Andesite: f/604.5'-607.5' gen med grn gry, mottled, speckled appr, com mlk wht felds up to 3mm, contact @ 607.5 (~80° oreientation) w/ frac in core w anhydrite along frac, minor calcite veining, v heavily chlorite altered.

Basalt: dom drkr in clr, drk grn gry, speckled appr, mafic, com micro fracs up to 3mm w/ heavy chlorite alt along these, grndmass non calc, tr calcite veining w/abt chlorite around veins, microxln, slt magnetic, no vis feld xls, com fracs occur ~45°, anhydryite along frac surfaces w/ smooth vitreous appr.

Andesite/Basalt: f/623'-628' overall lighter in clr, slt lrg xlts, epidote appr along calcite veins @ 628' contact.

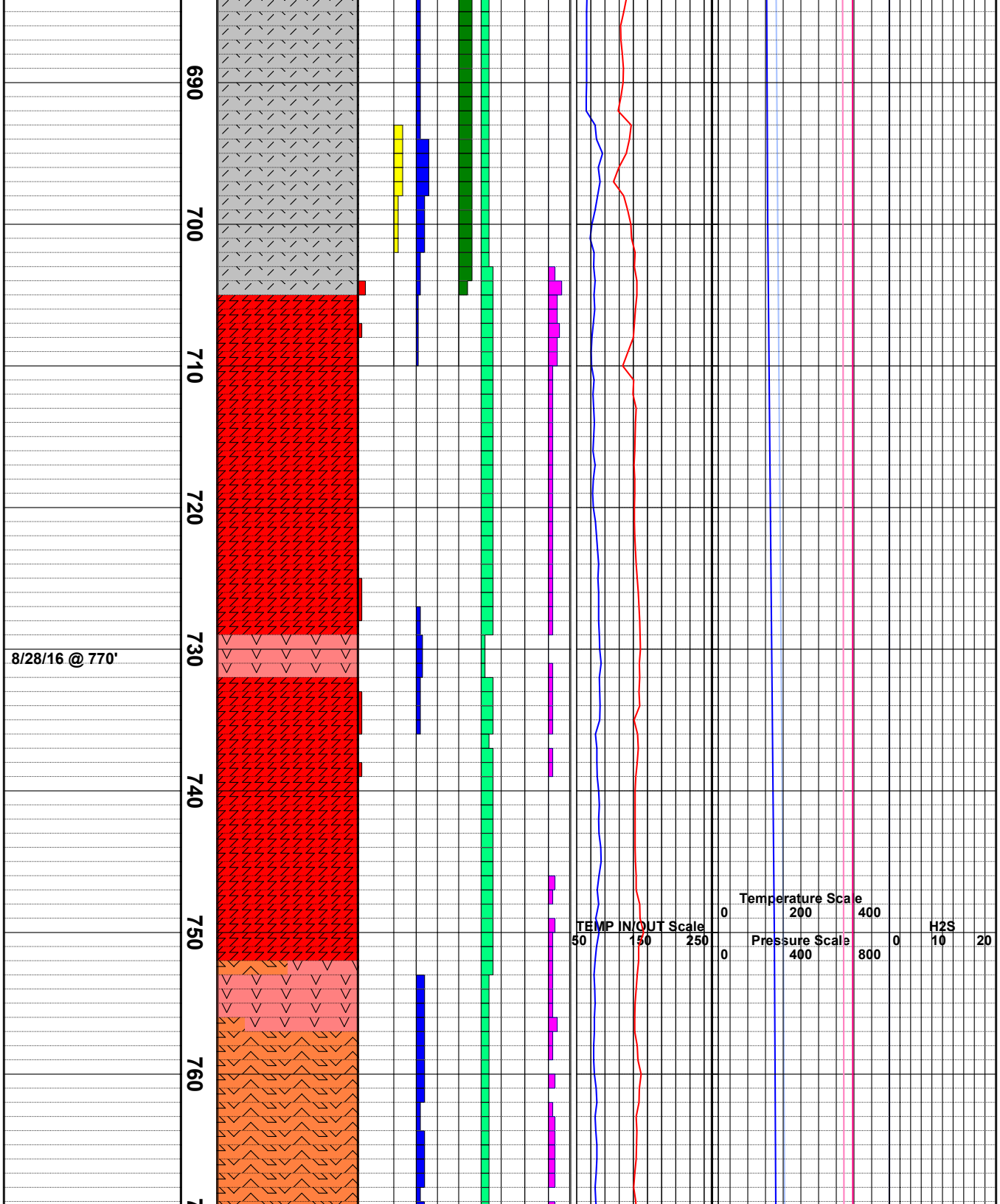
Tuff: f/628'-633', a/a, lt grn, rr circular calcite pockets (2ndry vug fill), rr calcite veining, cryptoxln, plain looking, high chlorite alt on 633' contact.

Andesite: f/638'-644' slt brecciated intermixed w/tuff, possibly a lahar, com calcite patchs, heavly chlorite alt throughout, tr diss 2ndry pyrite in vug fill, f/642'-643' core came out of tube all fractured up and broken, com anhydrite along fracs, w abt chlorite alt, & rr calcite.

NOTE: Core comeing out of hole @ 645' = 220° F

Basalt/Tuff: interlayered basalt and tuff layers, basalt gen drk gry, speckled w/ com felds throughout, com micro fracs w abt chlorite alt along fracs, v rr calcite along fracs in basalt, Tuff: a/a, v fn grain, lt grn gry, cryptoxln, rr to tr calcite vug fill.

Andesite: diff flow f/prev volcanics, dom med grn to gry, f/673'-675' frac area, v broken out of core tube, macroxln, v com epidote throughout section up to 3mm, 675'-694' dom same material, solid core through this section, slt crumbly when broken @ 685', macroxln, com mlky felds throughout, 2ndry milky qtz



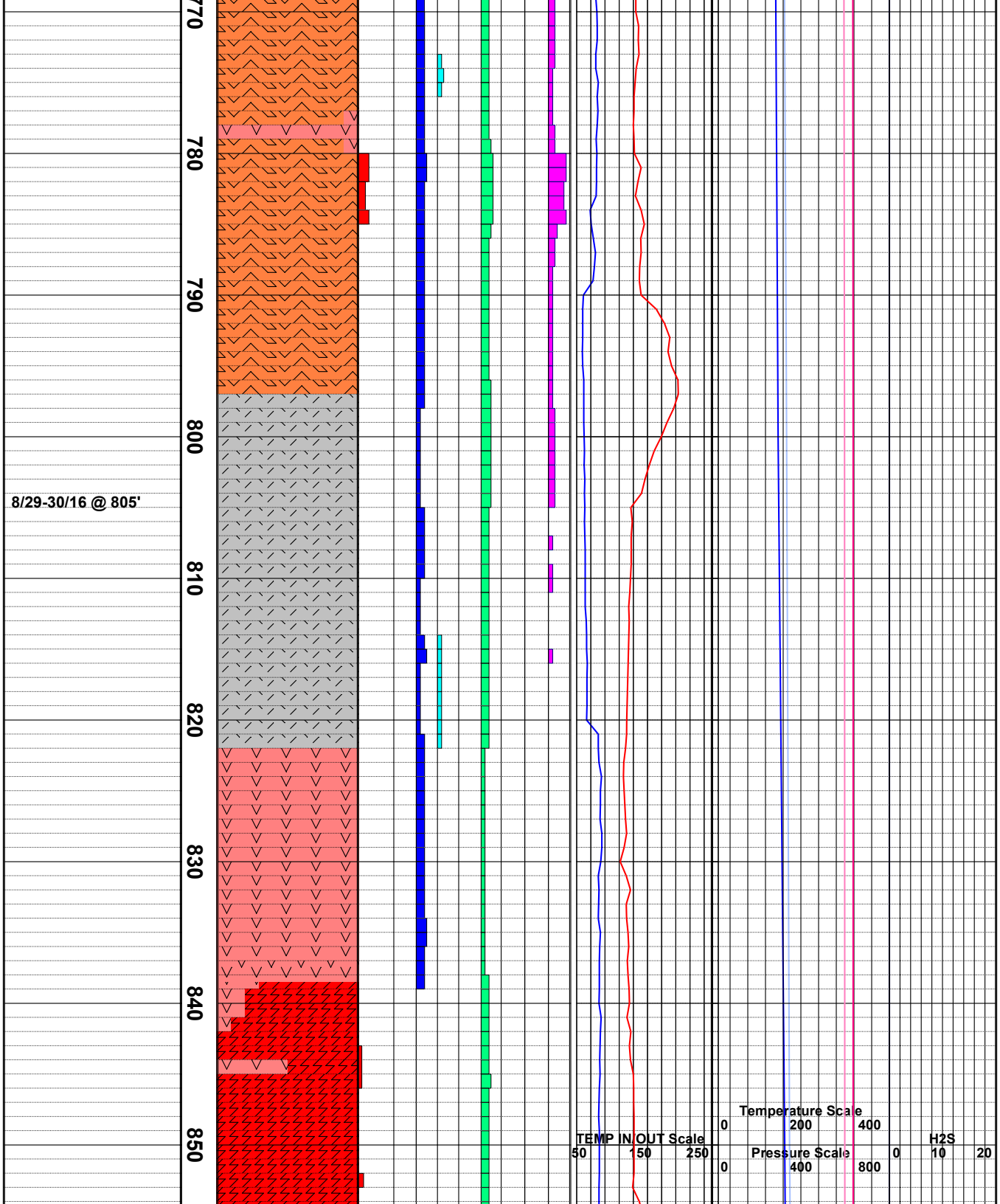
veins (up to 10mm) & calcite veining appr @ 693'.

Basalt: sharp wavy/flowy contact @ 705' (~45° orientation) w com chlorite alt & rr calcite, com fracs uphole w abt 2ndry anhydrite along surfaces, microxln, drk gry grn, mottled/speckled in appr, com mlky wht felds, drk gry to blk flaky w com anhydrite along natural break/fracs (10°-45°) in core, greasy smooth chalk feel between fingers, rr to abst rec w/HCL.

Tuff: f729'-732' lt gry grn, speckled circular sporatic calcite vug fill up to 4mm gen 0.25mm, rr calcite veining dom 0.25mm, less chlorite alt than surrounding volcanics, cryptoxln, v similar to other tuffs seen uphole, sharp contacts ~45° @ top & bottom of section, grndmass slt rec to HCL.

Tuff: gen a/a, lt to med grn gry, tr wht calcite vug fill, specks v sporadic, tr to rr calcite veining, microxln, v irregular wavy sharp contact @ 752', com chlorite alt grading into basalt, prob deposited w/high temperture & energy.

Lahar: overall gry grn, com sections of andesite w/ abt breccieated conglomerate looking sections, possibly heavly alt areas or/& deposited with high energy, v similar to andesites described above in sections, com chlorite & gd tr calcite in alter brecciated areas.



Tuff: @ 778-779' prob a larg lithic f/other tuff zones irregular wavy sharp contacts.

NOTE: f/780'-785', sample v broken and alter in this zone, dom chlorite & anyhydrite alter, prob fault zone, v greasy smooth feeling on surfaces of sample chunks, slt rec to HCL on surfaces, no visible calcite, similar lithology above and below this zone.

Andesite: med gry, slt grn hue, clr to milky wht feldspar laths, microxln, mod hd, scratchable w/probe, mod magnetic, com chlorite alt along natural breaks in core, rr rec w/ HCL.

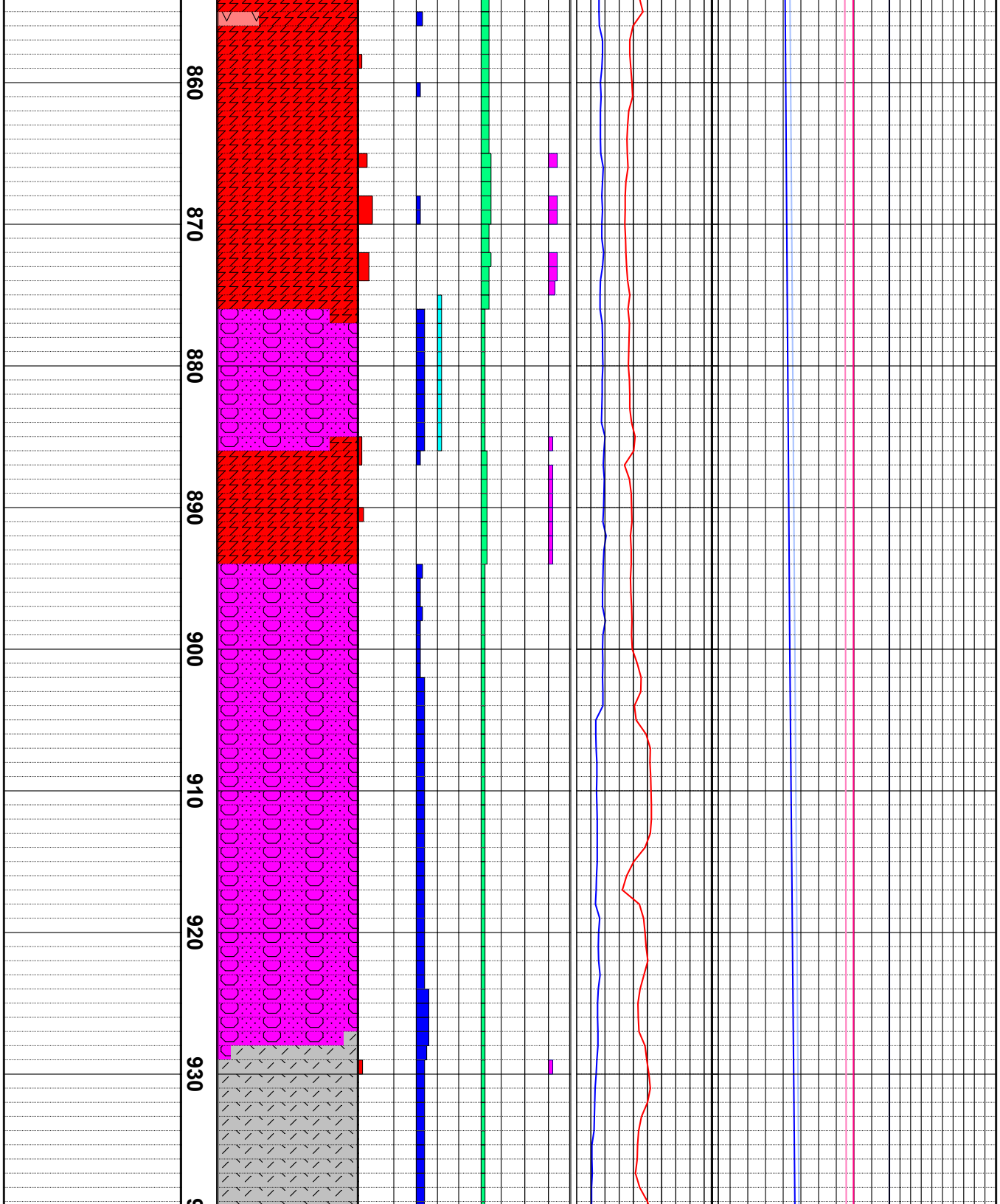
Survey @ 800' = 1°, MRT = 300+° F (Maxed out MRT)

NOTE: Drill to 805', Cool well, Run 4.5" casing to 800', Drill ahead with HQ core.

Andesite: drk gry, hues of grn, mottled appr, w/ specks of mlky wht anhedreal felds, gd tr 0.25mm fracs com filled with drk grn chlorite & tr calcite, com anhydryite greasy chalk feel along natural breaks, dom solid core, tr microscopic diss pyrite in grndmass, wk to no rec to HCL in grndmass.

Tuff: lt-med gry, v similar to other tuffs described, upper contact @ 822' sharp ~50° orientation, less alteration than previous contacts, tr chlorite, center of tuff having slt larger concentric slt squeezed mlky wht calcite filled vugs than top and bottom of unit, occ chlorite rims on vugs, grndmass having com rec to HCL.

Basalt: mod dark gray to dark grayish black, aphanitic, crypto - microporphyritic, com clr to mlky striated plag xls, dk greenish black chlorite on frac surfaces throughout, contact @ 838.5' v irregular sharp wavy, com fracs throughout more present near contact @ 838.5' dom solid core.



Basalt: drk gry to blk appr, v drk gry to blk on fresh frac surfaces, com anhydrite and chlorite alt on fracs, com v fn micro fracs thoughout basalt v flakey along planes, com to highly magnetic throughout zone, @ 843' chunk of tuff, core samples slt broken up, f/865'-866' & 868'-870' core broken up frac zone com anhydrite & chlorite alt thoughout zones, slt aligned clr striated felds 2mm on fresh surfaces, rr rec to HCL.

Lithic Basalt: med gry grn, conglomerate appr, incr calcite, dom solid core samples, v minor natural breaks, flowy mottled texture intermixed w/ basalt, cholrite alt more prominent around lithc flowy zones, rr-tr v fn diss pyrite vis underscope, rr-tr blk mag mnl underscope.

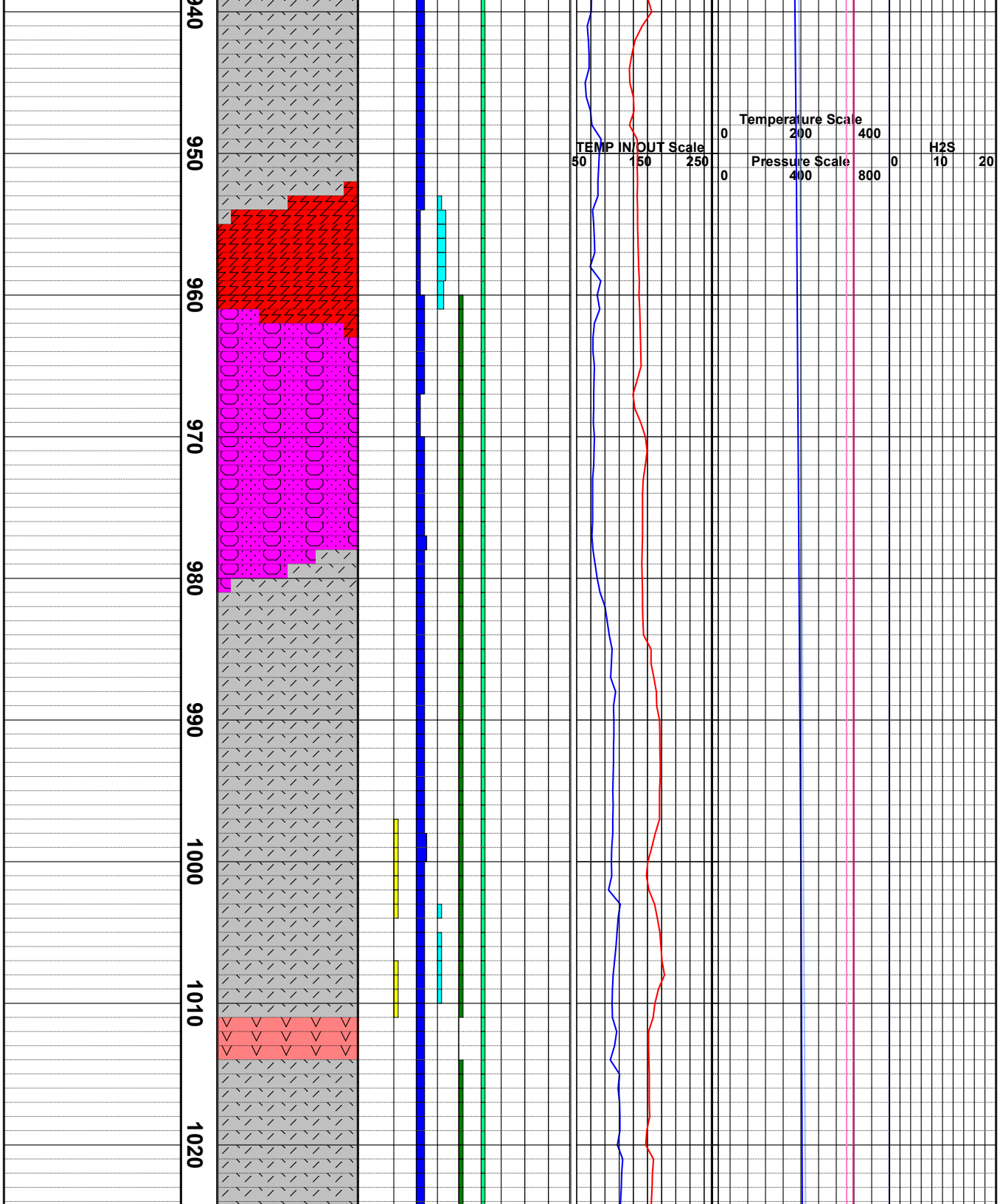
Basalt: gen a/a drk gry, drkr gry to blk along fracs, com anhydrite & chlorite along fracs, slt grad horizontal contact w no incr in alt @ 894'.

Survey @ 900' = 0.75°, MRT + 300°F

Lithic Basalt: overall med gry grn, mottled appr, blotchy, occ wht calcite patches, marble like appr, wk magnetic, dom solid core w v rr vis fractures, com wht to clr slt aligned felds ip, com rec to HCL, prob mass wasting deposit.

Basalt/Andesite: contact @ 928', com mlky wht calcite veining near contact w drk grn chlorite alt appr to have formed in the empty cavities/cracks between lithics, lithics appr to have been alt more than basalt itself, lithics gen lt grn gry in clr.

Andesite: @ 929'-930' ~70° f/horizontal frac v



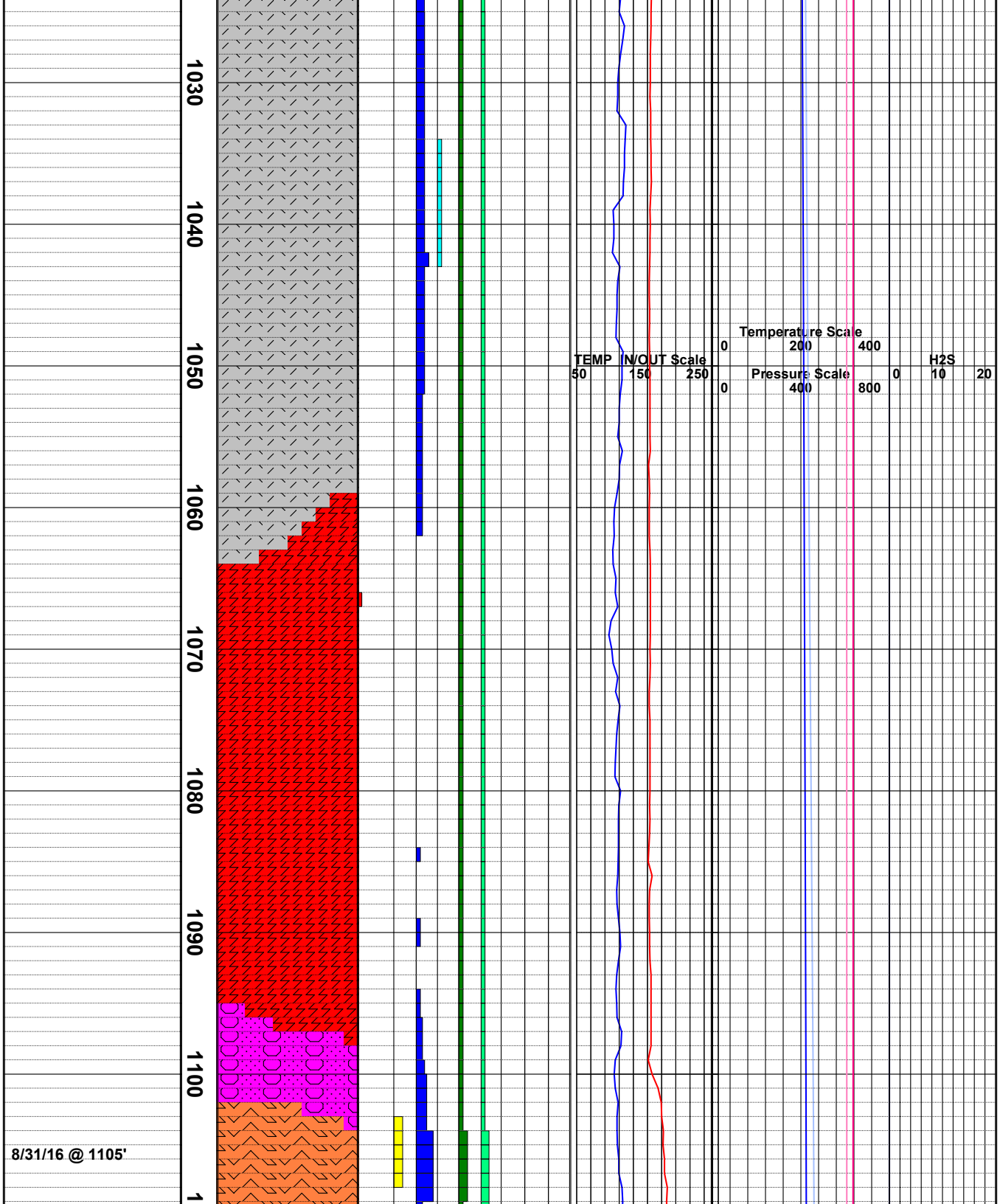
linear/stright break w minor striations and anhydrite, little to no 2ndry alt on frac surface, gen lt to med gry grn, speckled appr, com mlky wht felds throughout, top of flow having slightly smaller xlt size, slt to mod rec to HCL throughout grndmass, rr to abst calcite veining, dom solid core throughout section.

Basalt: f/ 952'-954' brecciated intermixing of flows, f/ lt grn to drk gry grn, chnging to a slt finer grained volcanic, tr vis diss pyrite ~953'-954', @ f/961' to 962' contact zone calcite vein w/ epidote vein 1mm in size.

Lithic Basalt: @ 963' grading into a more lithic xln volcanic, lithics up to 35mm, f/972'-973' lrgr milky clr felds up to 5mm appr in a small band/flow w/ near horizontal orientation, dom solid core w/ v miner natural fracs, ~978' lrg lithics bec less abundent dom same material.

Andesite: no solid contact between lithic basalt above, lithics gradually fade out and dissapate, minimal to slight variations in compostion and grain size thorughout zone, drk grn hexagonal anhedral to euhedral cpx (augite/diopsite?) xlts bec lrger w/ depth up to 5mm, slt more com veining appr f/995'-1005', com chlorite alt thoughout.

Tuff: f/1011'-1014', lt to med gry, crypto-microxln, rr sporatic clacite filled vugs, slt drkr appr @ contacts, tr calcite veining, v similar to other tuffs encountered, slt rec to HCL in grndmass.



Andesite: gen a/a, med gry grn overall appr, xlts composed of epidote and calcite up to 5mm, macroxln, com euhdral clr-milky feldspar laths, com drk gry to blk mnl, dom solid core w/ v few natural breaks dom horizontal natural breaks, v rr pyrite diss throughout grndmass.

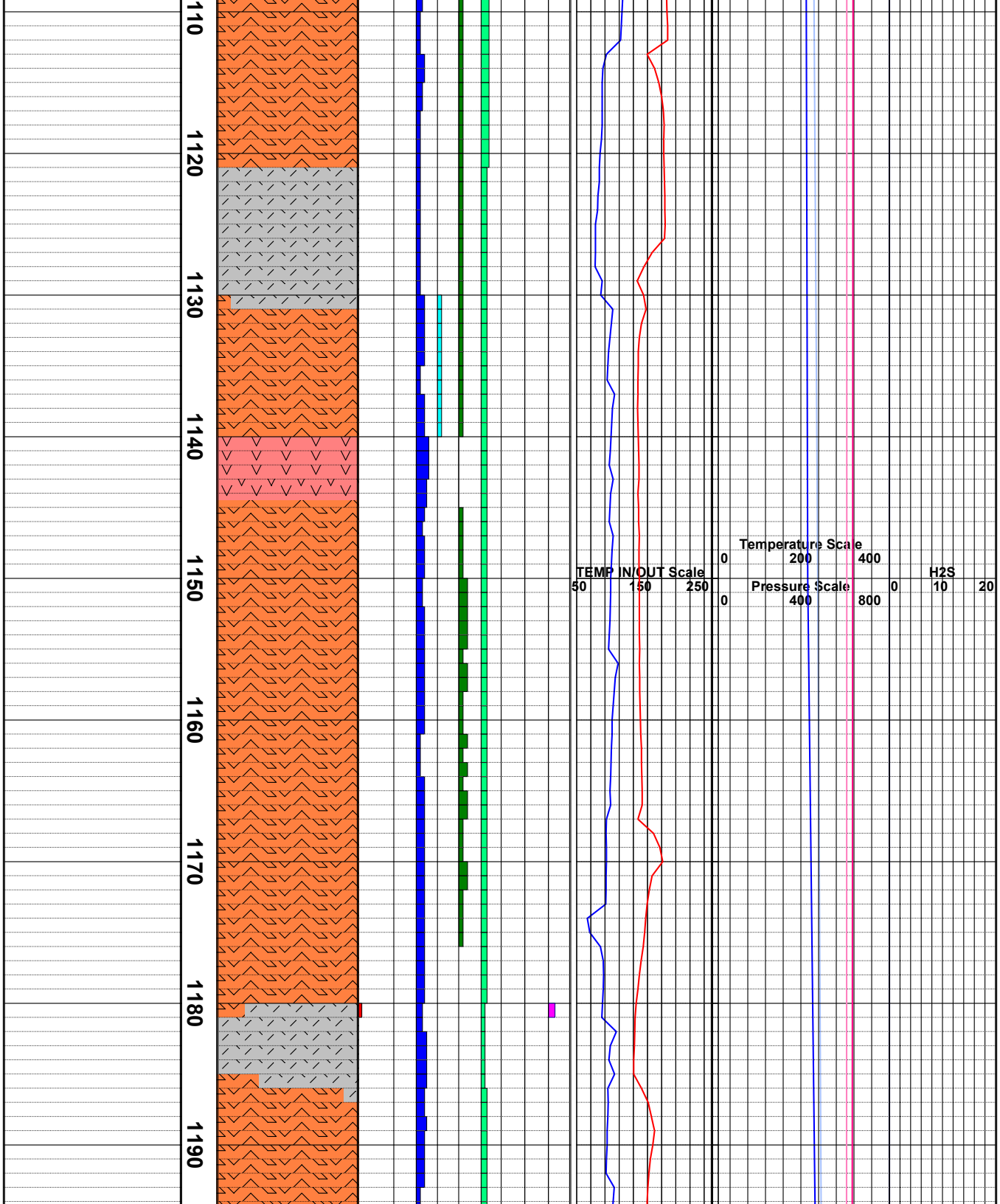
Basalt:~1062' No real contact, prob same flow as above, slt drker appr w/ smaller xlt size overall, solid core throughout, minor natural breaks/fracs with blk flakey material on surfaces, @ 1066-1067' minor frac poss boundry between flows?.

Basalt: drk gry to blk, microxln, com drk grn alt epidote xlts up to 3mm, v soft blk mnl on fresh surfaces (easily scrachable w/ probe) changing to clay like substance, com chlorite alt, com clr euhedral felds.

Lithic Basalt: f/1095'-1102' lrg lithic appr in volcanics, gen lt gry grn, tr redish FeOx stnged, well rnded lithics up to 30mm composed of same volcanic material as grndmass, tr calcite veining w rr epidote along veins appr in this section, mod cemented, slt to mod rec to HCL.

Survey @ 1100' = 1°, No MRT

Lahar: f/1104'-1108' lrg vein system appr dom calcite, gd tr euhedral clr qtz in cavities, w/ tr epidote in veins, dom solild veins w/ small open spaces.



Lahar: lt gry grn to med grn gry, dom solid core w minor natural breaks, brecciated mottled appr, prob mass wasting deposit, com chlorite alt along edges of brecciated material, marble looking appr, occ 2ndry calcite, com milky wht feldspar laths.

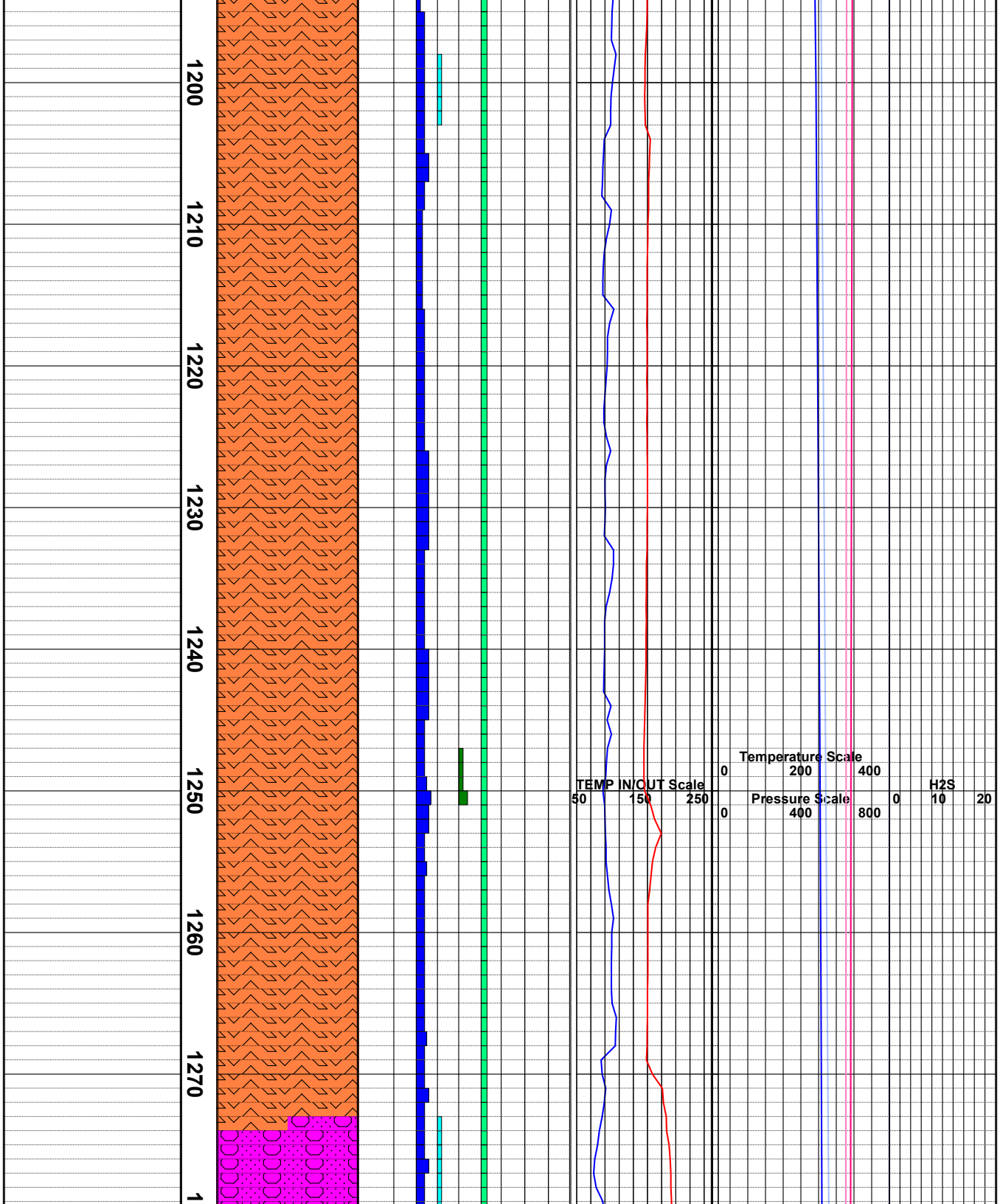
Andesite: f/1121'-1131', lt to med gry, speckled wht appr, com mlky wht felds, prob lrg lithic in mass wasting deposit composed of andesite, gradual contacts, microxln, v wk to abst rec to HCL.

Lahar: gen a/a, lt grn gry, mottled marble appr, rr tr diss pyrite in chlorite alt areas.

Tuff: lt gry, v similar to tuff's uphole, lt gry grn, speckled circular sporatic calcite vug fill, tr calcite veining, less chlorite alt than surrounding volcanics, tr open cavities along veins w/ ehuhedral calcite veining.

Lahar: gen a/a, lt gry grn to med grn gry, dom solid core w rr natural breaks w rough surfaces along breaks w clay like powder on surfaces, brecciated mottled appr, prob mass wasting deposit, com chlorite alt along edges of brecciated material, marble looking appr, com 2ndry calcite, com milky wht feldspar laths.

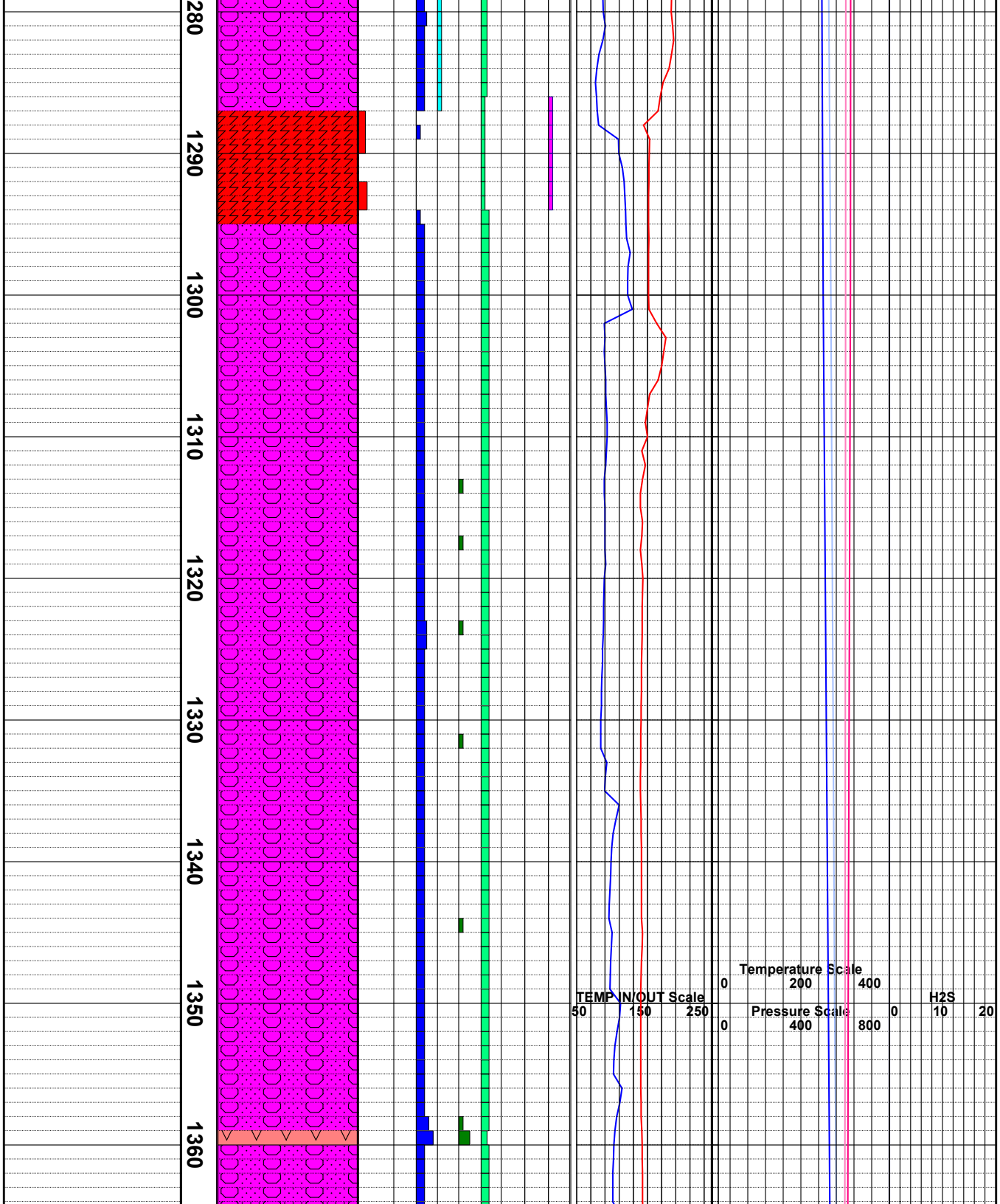
Andesite: lt gry grn, cryptoxln, com clr felds, frac @ 1080'-1081' w/ chlorite alt & anhydrite, abst calcite on surfaces, prob a large lithic in the mass wasting Lahar deposit.



Lahar: cont the same flow/volcanic unit, gry to grn mottled breccited appr, com calcite throughout, com chlorite alt, rr v fn diss pyrite.

Lahar: lt grn & med gry, com mlky wht splochy thoughout, brecciated mottoled appr througout, com drk grn hexagonal xlts up to 5mm primary cpx (augite, possibly diopsite?), prob a mass wasting deposit, f/1249' to 1251' mlky wht calcite vein w tr amounts of epidote. dom solid core thoughout tr natural breaks.

Lithic Basalt: gry grn, mottled, speckled wht on bit cut surfaces, dom med grn gry on broken surfaces, com grn circular filled vugs (prob chlorite filled vesicals) underscope, @ 1276' lrg lithic 8 inch mainly composed of circular calcite filled vugs up to 6mm,



transitioning into a lithic rich flow, med grn gry in clr w lithics slt ltr grn in clr up to 10mm.

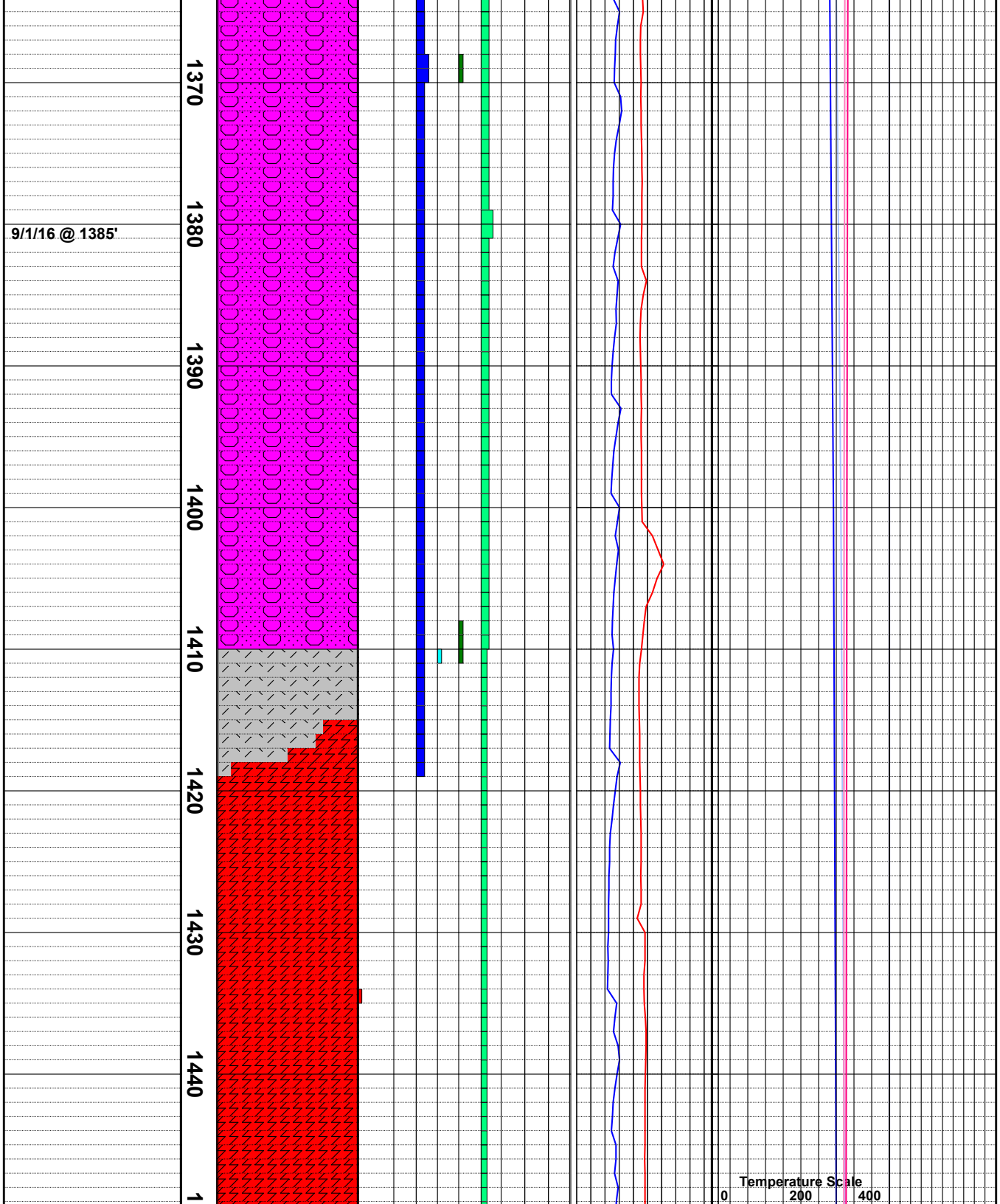
Basalt: drk gry to blk, dom mafic mnls, drk gry to blk w grn hues underscope, cryptoxln, tr clr feldspar laths, f/1287'-1294' core fracture up, tr chlorite & anhydrite alt on frac surfaces, frac surfaces dom 45-50° sharp/stright angle w/ striations throughout, rr calcite, tight fracs w/ no voids, indicating minimal to absent flow/water zone.

Survey @ 1300' = 1°

NOTE: Bit trip @ 1301'

Lithic Basalt: med grn gry, macroxln to microxln, com wht speckled appr (felds), overall tr - mod rec to HCL, dom solid core w/ few natural breaks, rr tr epidote in lithics, lithics gen have lrgr wht concentric vug fill on bit cut surfaces, com drk grn circular nodules less than 1mm (chlorite vug fill) on fresh broke surfaces, v com chlorite alt thoughout samples, bec slt less mag after 1294'.

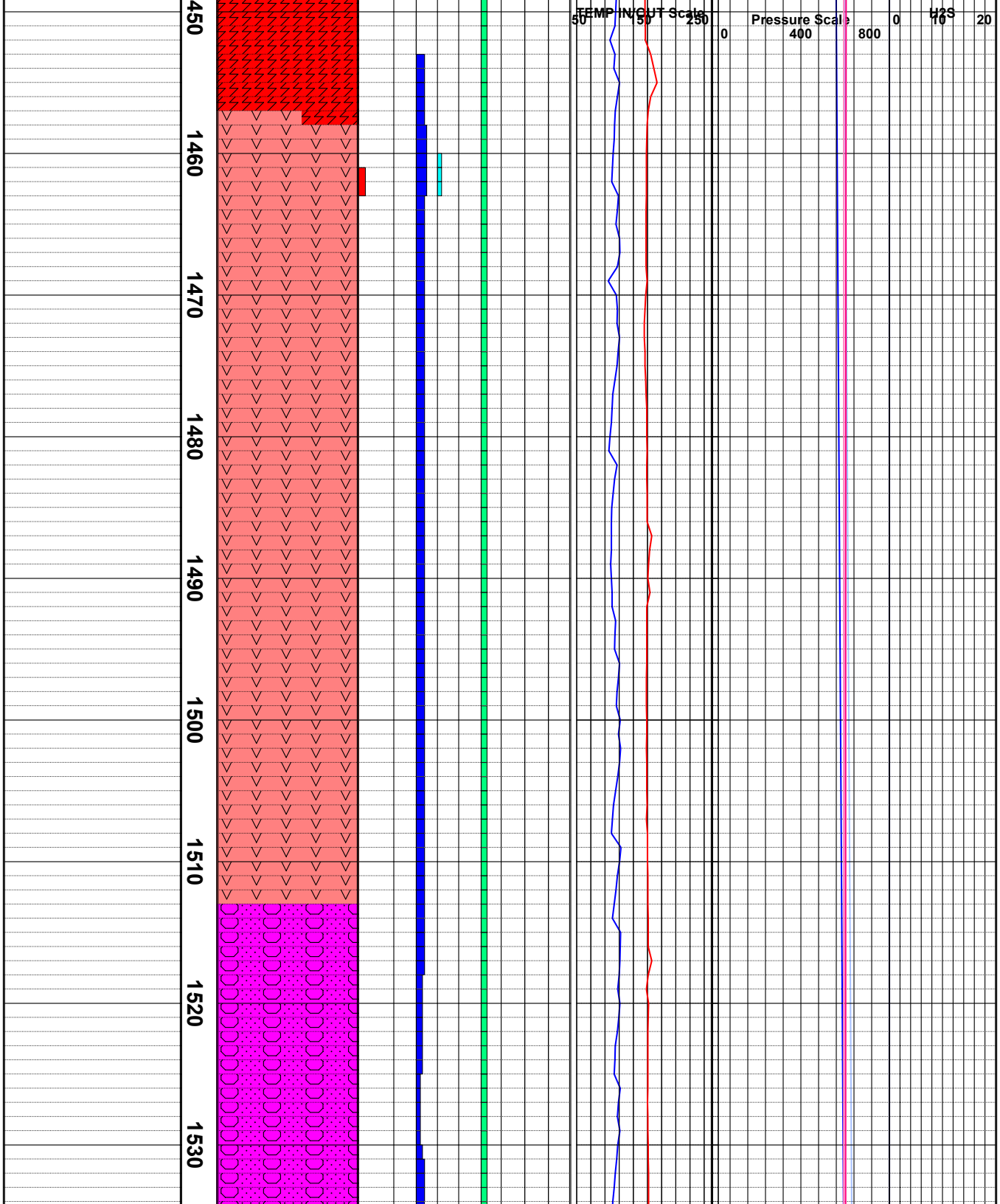
Tuff: f/1359'-1360' lt gry grn microxln, tr less than 1mm concentric calcite vug fill thoughout, mod rec to HCL, top & bottom contacts have same bedding angle ~ 55°, top contact contains com acicular radiating euhedral epidote in calcite vein w small voids, volcanics above and below tuff v similar in lithology suggesting tuff is a large lithic?



Lithic Basalt: med gry w grn hue on drilled surface, dom gry grn on broken surface, speckled appr, marcoxln to microxln, tr calcite veining @ 1368', tr epidote in grndmass, lithic vary in size up to ~4 inch composed of similar volcanics, slt variations in lithics such as circular vug fill to euhedral feldspars.

Andesite: lt to med gry grn, crytoxln, plain overall appr, tr epidote along natural break in core, rr tr flakey pyrite occuring w/ drk redsh vitreous mnl.

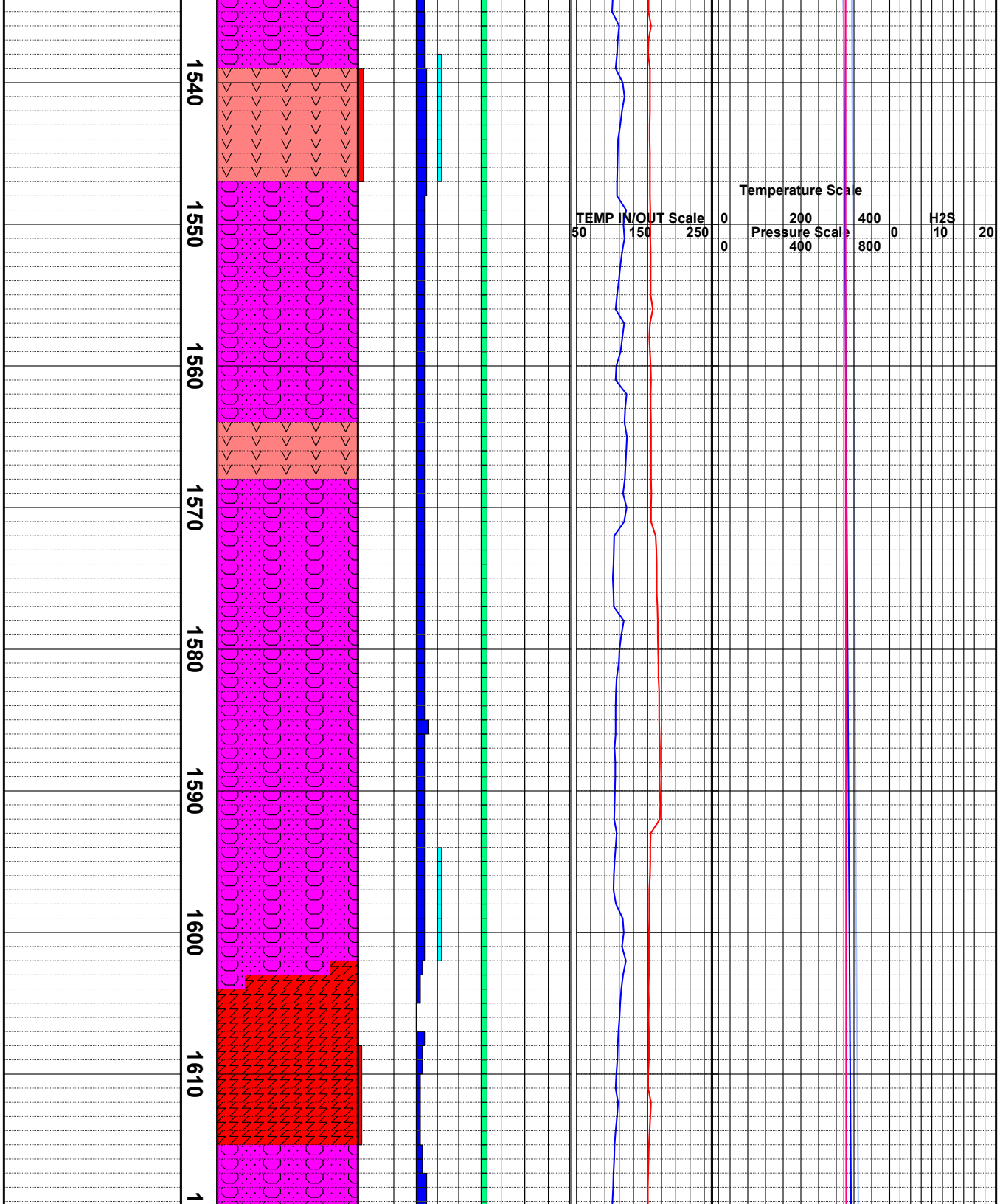
Basalt: drk gry to blk, v mafic, cryptoxln, com drk grn mnl thoughout (augite,diopsite?), wk to slt magnetic, com clr felds, rr to abst rec to HCL.



Tuff: lt gry grn, felsic, cryptoxln, tr calcite veining along fracs f/1461'-1463' w/ rr diss pyrite @ fracture area, slt diff f/ previous tuffs described (felds vis), slt orientated/squeezed feldspars, trachytic, rr blk specks underscope, possibly same tuff w/ more alteration, dom solid core w/ v few minor natural breaks, com calcareous throughout, rr-tr ~1504' vugs w/euhedral calcite xlt growth.

Survey @ 1505' = 1.75°, No MRT

Lithic Basalt: gen a/a, dom gry grn, phaneritic, mafic, lithics gen lighter grn in clr, slt variations in composition and grain sizes, com slt rec to HCL throughout, com speckling of wht calcite filled vugs throughout, weakly magnetic ip, microxln, com clr feldspar laths, dom solid core w/ few minor natural breaks.



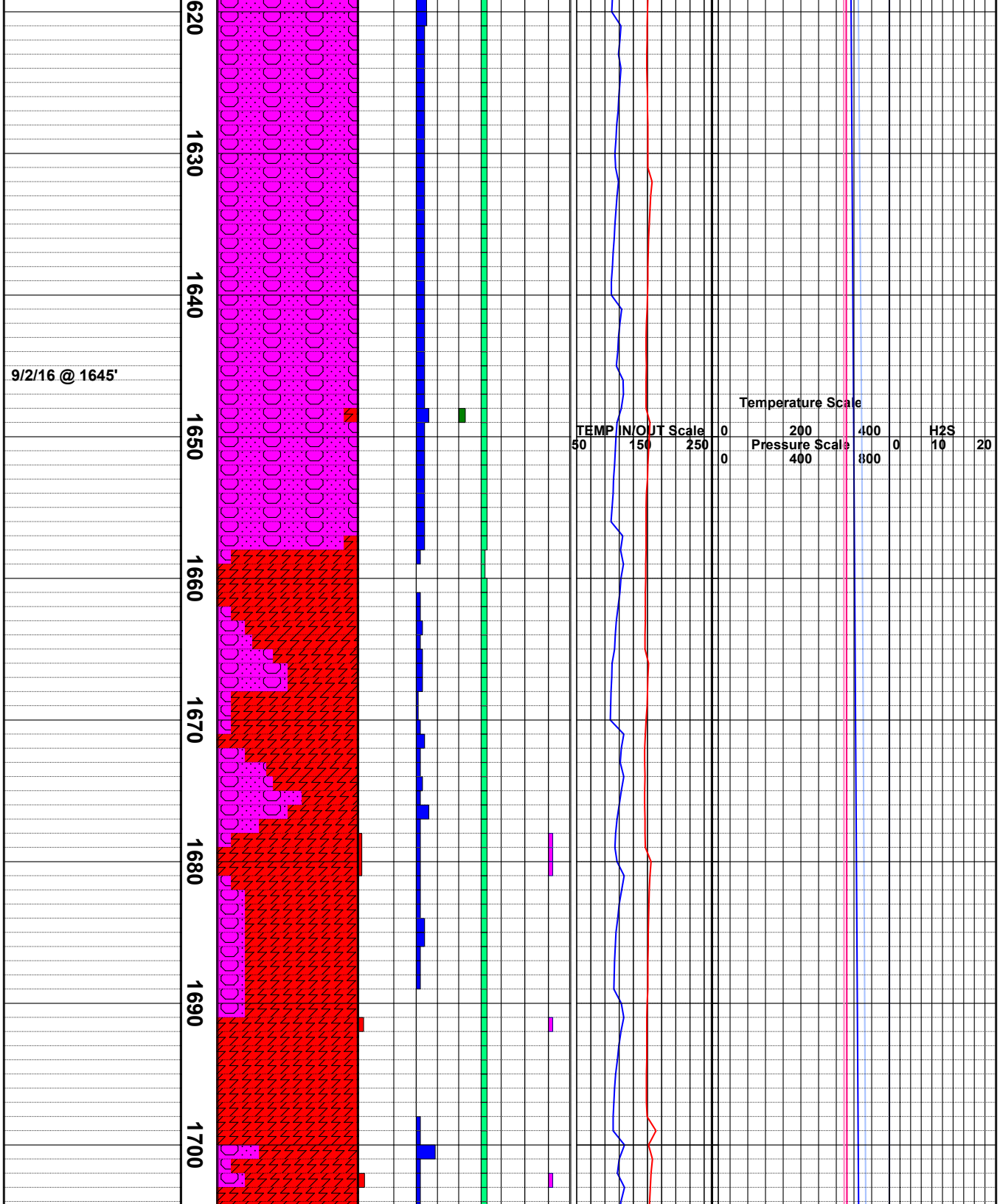
Tuff: similar to previous tuff, lt gry w/ hue of grn, felsic, fractured through section along com plane ~60° w slt com calcite along planes, no evidence of voids/cavitites, tr v fn diss pyrite, mod rec to HCL.

Lithic Basalt: a/a, overall grn gry mottled/speckled appr, dom mafic, slt multiclrd lithics shades of grn, rr lt redsh grn, drkr grays, com wht specks (calcite filled vugs, feldspars), subhedral to euhedral clr to mlky felds, com chlorite alt, abst calcite veining, overall mod rec to HCL.

Tuff: lt gry grn, felsic, aphanitic, cryptoxln, equigranular, tr mlky wht specks, abst calcite veining, overall mod rec to HCL.

Lithic Basalt, a/a, grn gry, mafic, dom phaneritic, gen 5-8mm up to 70mm, lithics subrd multiclrd, com felds, mod rec to HCL.

Basalt: med gry to drk gry, phanerititc ip, aphanetic, mafic, cryptoxln, com to stng magnetic, slt granular tex, rr small fracs f/1608'-1615', tr anyhdrite w/ greasy smooth tex along rr fracs, abst calcite along fracs, rr to abst rec to HCL.



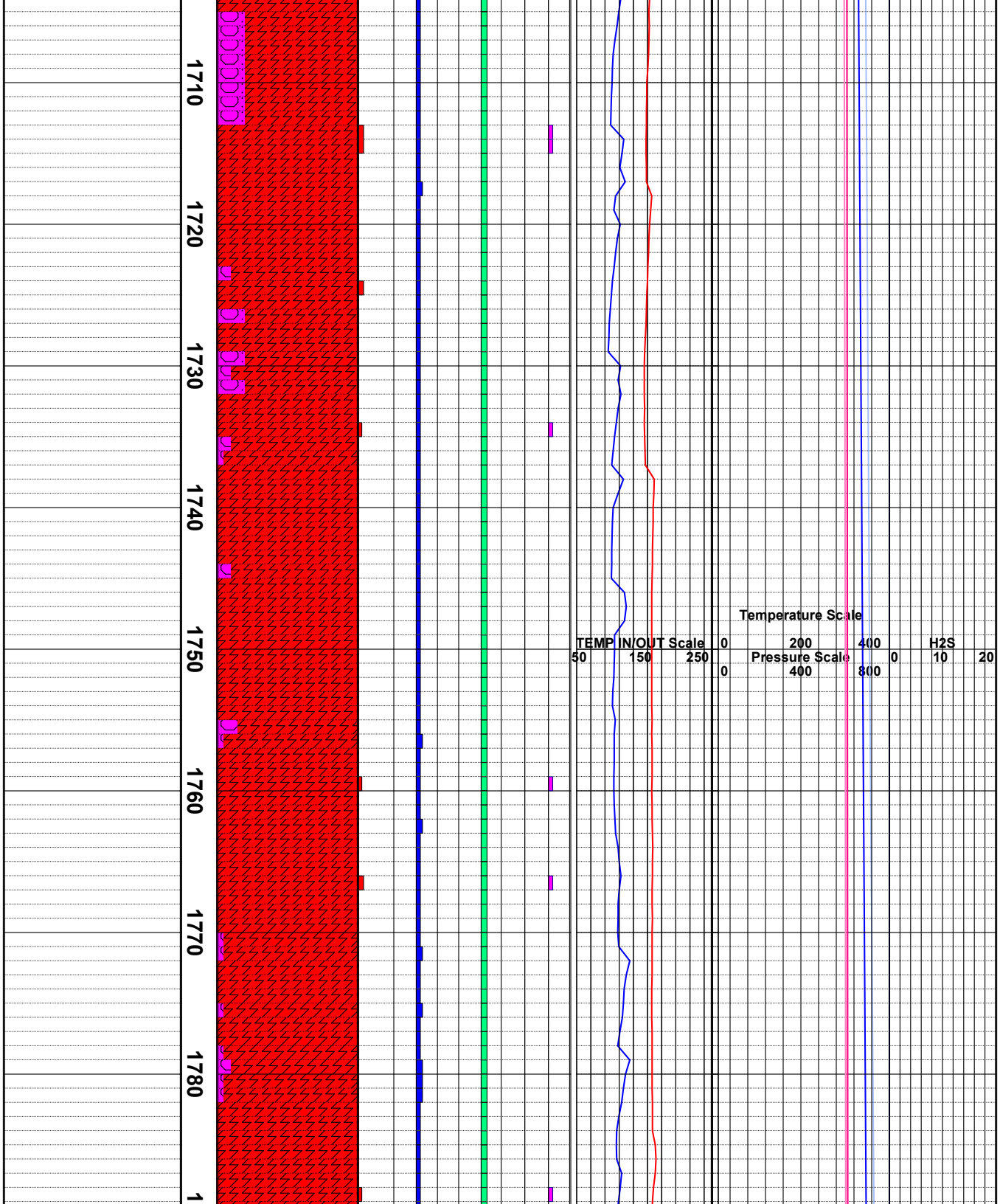
Lithic Basalt: dom drk gry grn, phaneritic, mafic, rr slt variations in composition and grain sizes, com slt rec to HCL throughout, com speckling of wht calcite filled vugs throughout, weakly magnetic ip, microxln, com clr feldspar laths, dom solid core w/ few minor natural breaks, f/1640'1645' incr in lithic size w/ com chlortite alt along edges of lithics.

Lithic Basalt: a/a, f/1648'-1649' up to 10mm vesicular drk grn bubbles appr w/dom chlorite fill & gd tr calcite fill w/ rr epidote, drk grn gry, dom mafic comp, slt magnetic.

Basalt: drk gry to blk in clr, mafic, stng magnetic, com wht speckling (felds), clr to mlky euhedral to subhedral feldspar laths underscope, wk to abst rec to HCL.

Lithic Basalt: a/a, com throughout, mafic, slt marble splochy appr, com chlorite alt througout, st rec to HCL, f/1671'-1672' vesicular drk green chlorite & calcite filled vugs v similar to 1649' interval, f/1676'-1677' calcite veining up to 5mm.

Basalt: drk gry to blk, slt hue of grn, mafic, mod to strg magnetic, speckled wht appr, com subhedral to euhedral clr felds up to 2mm, tr anhydrite on frac surfaces, com chlorite alt along natural fracs, rr to abst rec to HCL, f/1670'-1671' abt 2dry calcite w chlorite alt, solid core throughout zone, micro faulting appr?.



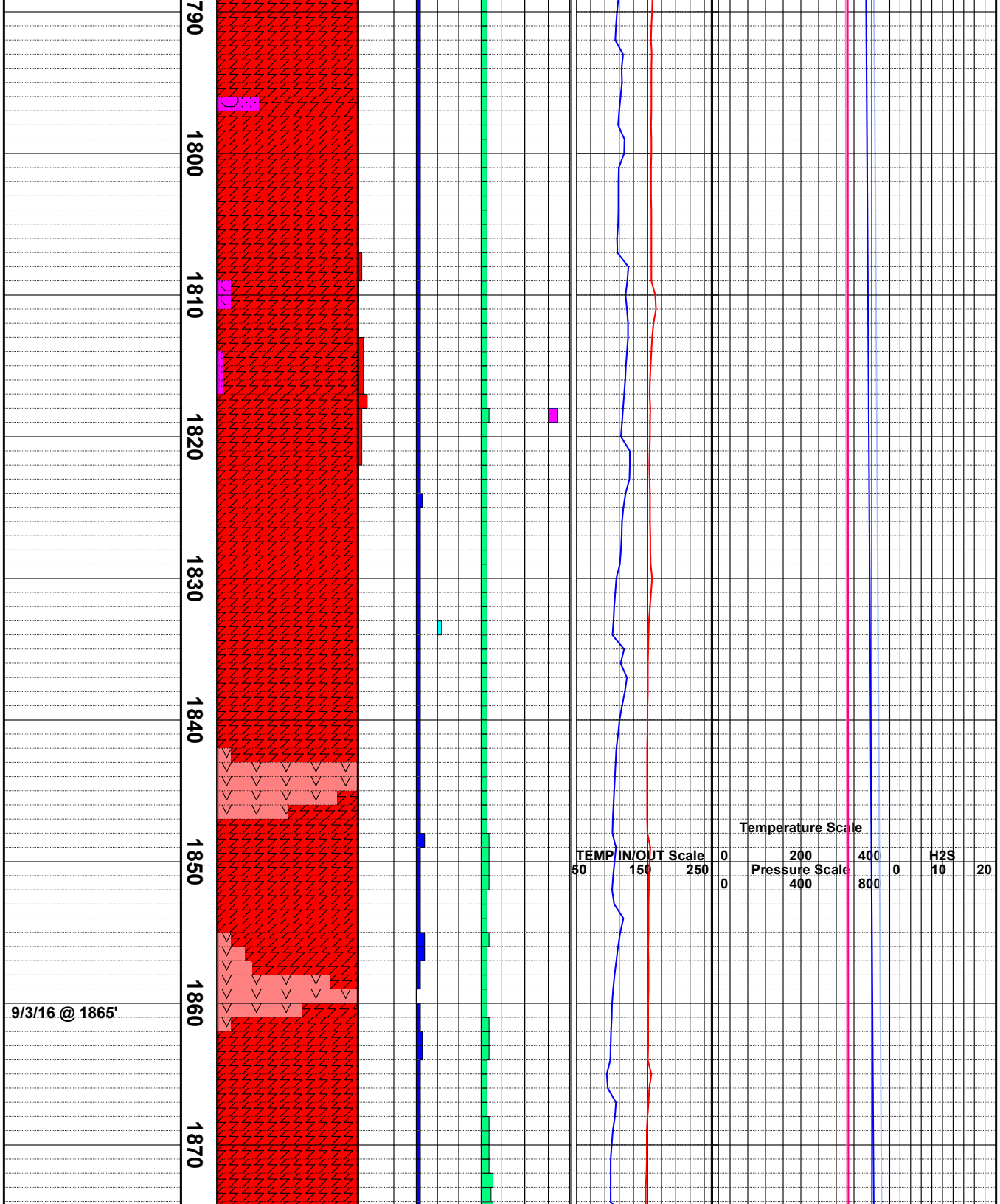
Survey @ 1700' = 1°, No MRT

Basalt: dom drk gry to blk, com clr w/ slt mlky appr subhedral to euhedral feldspar laths up to 5mm, slt com chlorite alt, com lrg (~1') fn grained basalt lithics throughout (logged as the lithic basalt) com chlorite alt surrounding lithics, slt to mod magnetic, tr - absent rec to HCL, gd tr drk grn/blk natural cracks/fracks gen 1mm w/ abt chlorite alt filling & rr calcite.

Basalt: a/a, drk gry to blk, microxln, f/1848'-1849' tr calcite veining w/ soft (scratchable w/ probe) red mnl forming within vein.

Core Sample temp = 210° F @ 1756'

Basalt: a/a, drk gry to blk, speckled appr, com clr to milky feldspars, slt chlorite alt, occ chlorite veining w/ higher alt surrounding fracks/veins, dom solid core w/ few natural breaks, com anhydrite along breaks/fracks, rr calcite & veining, rr to abst rec to HCL.

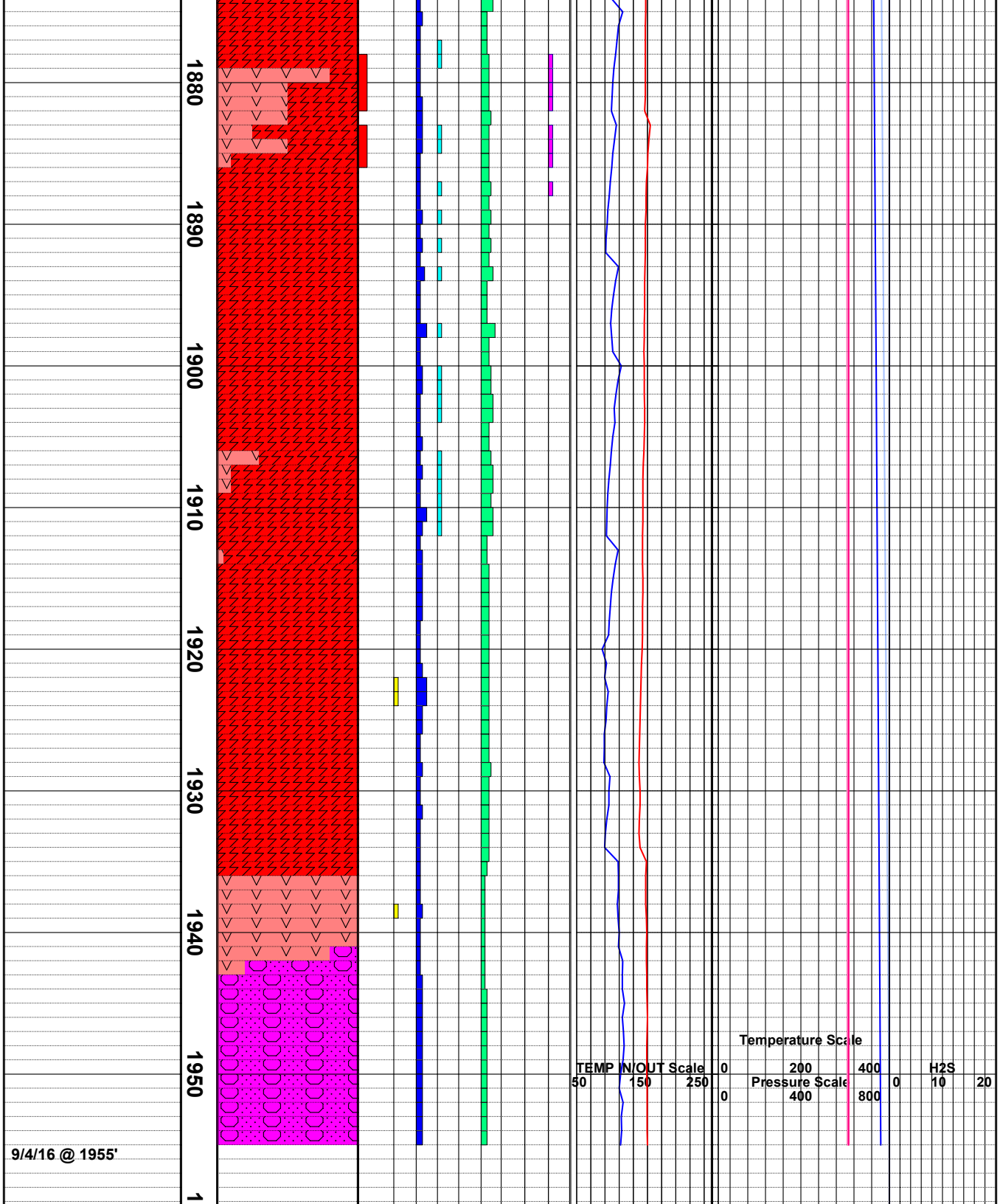


Basalt: dom drk gry to blk, mafic, com vis wht specks (clr-mlky feldspars) in hand sample, com chlorite alt througout more prominet on fracs/veins, weakly magnetic, tr natural breaks, f/1817' to 1818' fault structure ~80° w/ very vis stirations w/ tr amounts of anhydrite/fault gouge, movement appers to be in one direction (down ~10°) no change in lithologys above & below structure, rr-tr clacite along veins, rr to abst rec to HCL overall, f/1833'-1834' calcite veining with gd tr microscopic pyrite througout vein & surrounding rock near vein.

Tuff: lt gry, microxln, granular tex, plain appr, rr specks of wht, v rr to abst rec to HCL, com chlorite alt along contacts, v wk rec to abst rec to magnent.

Basalt: a/a, f/1848'-1849' tr calcite veining w/ soft (scratchable w/ probe) red mnl forming within vein.

Tuff: a/a, lt gry, apahnetic, tr calcite veins @ top contact, wavy irregular contact zones, com chlorite alt/riming into tuff, v rr to dom abst rec to HCL.



NOTE: f/1878' to 1886' core sample fractured, intermixed tuff & basalt, com chlorite alt, no evidence of voids (no euhedral xlts or abdt 2ndry mnls), driller reported slt pressure loss, slt brecciated chlorite alt along flow margins/tuff basalt contacts (unseen before), tr diss pyrite in basalt abst in tuff, slt rec to HCL.

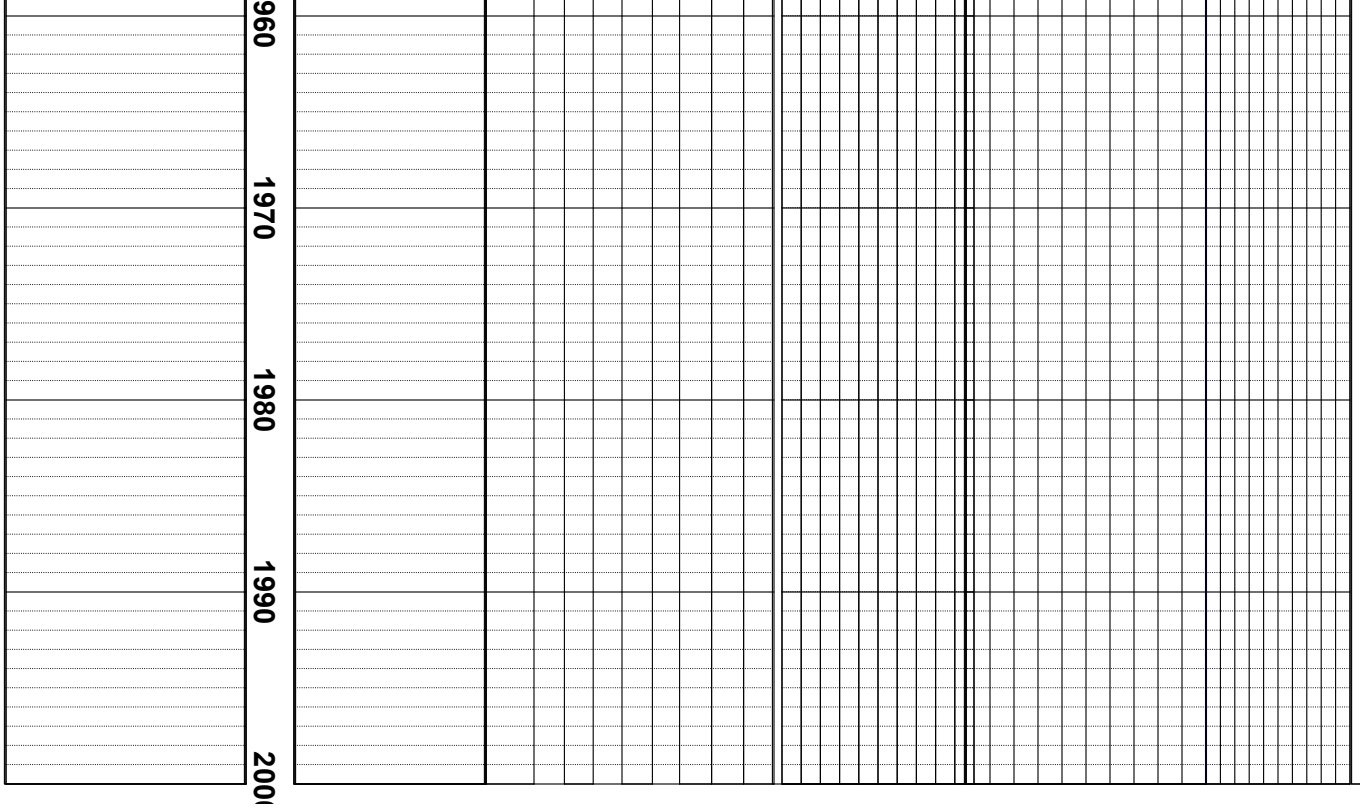
Survey @ 1900' = 2°, No MRT

Basalt: gen a/a, slt com chlorite vein brecciated material up to 4 inch thick w/com calcite and gd tr slivery clrd pyrite, gd tr micro circular/concentric drk grn chlorite vug fill?, 2ndry anhedral mlk wht qtz & calcite vein appr f/1922'-1924'.

NOTE: Drill to 1919' POOH for new bit.

Tuff: @ 1936' lt gry microxln tuff appr w/ sharp contact ~38° orientation, rr 2ndry alt on contact, tr horizontal bedding/fracture/break? within tuff @ 1937', squeezed looking calcite vugs near top and bottom of unit, circular calcite & qtz vugs w/ tr euhedral xls growths near center of unit @ 1939', grading back into a basalt ~1943', slt rec to HCL.

Lithic Basalt: slt ltr color then previous basalt, lithics up to 10 inchs w/ macroxln blk & wht speckled appr gen larger mlk wht circular calcite vug fill up to 5mm, little to no chlorite alt on lithic fragments, grndmass is overall slt finer grain than lithic w chlorite alt grn hue & overall less rec to HCL, com clr to mlky wht felds throughout.



NOTE: TD well @ 1955' @ 1800 hrs on 9/4/16, change well over to water, run first temp/press survey, rig down rig, run 150' perf liner on bottom then alternate 1 blank & 4 perf to 755', 755' to 805' blanks, (~24hrs), run survey #2.