EPOCH

WELL LOGGING, INC.

COMPANY	ARCO OIL AND GAS COMPANY
WELL	Columbia County 31-27-65
FIELD	MIST
LOCATION	North 89°05'32" West 1642.07' South 0°54'28" West 762.15' from NE corner of Sec 27, T6N, R5W
COUNTY, STATE	Columbia, Oregon
API WELL INDEX NO.	
ELEVATION	748.39' G.L. 758.39' K.B.
DATES	**FROM** 8-19-87 **TO** 9-21-87
DEPTHS	**FROM** 40' K.B. **TO** 6700'
SPUD DATE	8-19-87
DRILLING CONTRACTOR	Taylor Drilling Co. #4
MUD COMPANY	M-I Drilling Fluids Inc.
LOGGING GEOLOGISTS	Bill Gilmour Jeff Duval

ABBREVIATIONS

NB	BIT	MW	MUD WEIGHT
RRB	RERUN BIT	VIS	FUNNEL VISCOSITY
RTB	RE-TIP BIT	PV	PLASTIC VISCOSITY
CB	CORE BIT	YP	YIELD POINT
T.G.	TRIP GAS	FL	FLUID LOSS (cc/30 min)
S.G.	SURVEY GAS	CL	PPM CHLORIDE ION
W.G.	WIPER GAS	RM	MUD RESISTIVITY
C.G.	CONNECTION GAS	RMF	FILTRATE RESISTIVITY
WOB	WEIGHT ON BIT	LAT	LOGGED AFTER TRIP
RPM	ROTARY REV/MIN	NR	NO RETURNS
PP	PUMP PRESSURE	PR	POOR RETURNS
SPM	STROKES/MIN	MUD TYPE	

CASING RECORD

13.375"	AT	40'
9.625"	AT	994'
	AT	
	AT	

HOLE SIZE

12.25"	AT	996'
8.50"	AT	6700'
	AT	
	AT	

			CHERT	
· SAND	CLAY	⌶ LIMESTONE	G GLASSY	X INTRUSIVE
— SHALE	DIATOMITE	Z DOLOMITE	A ARGILLACEOUS	b/a Basalt Andesite; t Tuff
–· SILTSTONE	Ø CONGLOMERATE	V VOLCANICS	P PORCELANEOUS	d/r Diabase Diorite

OIL: BASED ON LIVE OIL IN UNWASHED CUTTINGS AND PERCENT STAINING AND FLUORESCENCE OF WASHED SAMPLES.

PENETRATION — ANALYSIS OF RETURNS — REMARKS

EPOCH WELL LOGGING, INC.

DRILL RATE (FT/HR)

drilling data

DEPTH

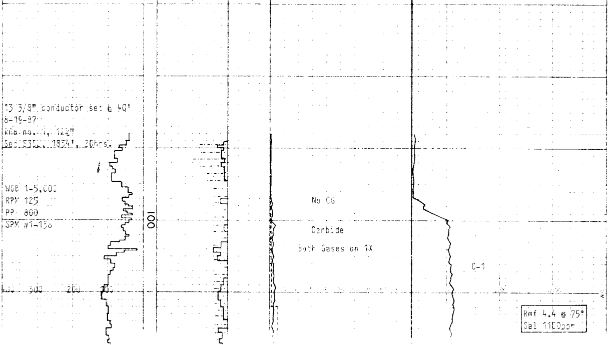
LITHOLOGY

OIL: TRACE, STRONG TRACE, SHOW, STRONG SHOW

GAS — UNITS: DITCH — TOTAL GAS; CUTTINGS GAS; CALIBRATION 100 units = 2% methane by volume

CHROMATOGRAPH — PPM:
METHANE, C-1,
ETHANE, C-2,
PROPANE, C-3,
BUTANES, C-4, 4
PENTANES, C-5, 5

LITHOLOGIC DESCRIPTION
MUD PROPERTIES
SURVEYS, OTHER TEST DATA



13 3/8" conductor set @ 40'
8-19-87
RRB no. 1, 12¼"
Sec 535[illegible], 1834', 20hrs.

WOB 1-5,000
RPM 125
PP 800
SPM #1-136

Note: All colors are referenced to the GSA rock color chart.
--All carbides are 400gms unless otherwise noted.
--All connection, survey, and carbide gases are reported as units above background: trip gas is reported as maximum gas units.

MW 9.0 VIS 41

Sandstone: lt olv gry; vfn to fn; fria to soft + solu; v argil, silty; pr srtd; pr por; fnly lam w sltstn + carb mat; occ kaolc; noncalc; qtz, fspr; mica; carb mat; occ med lithic gr; tr chlor; occ shell frag; no fl or cuts.

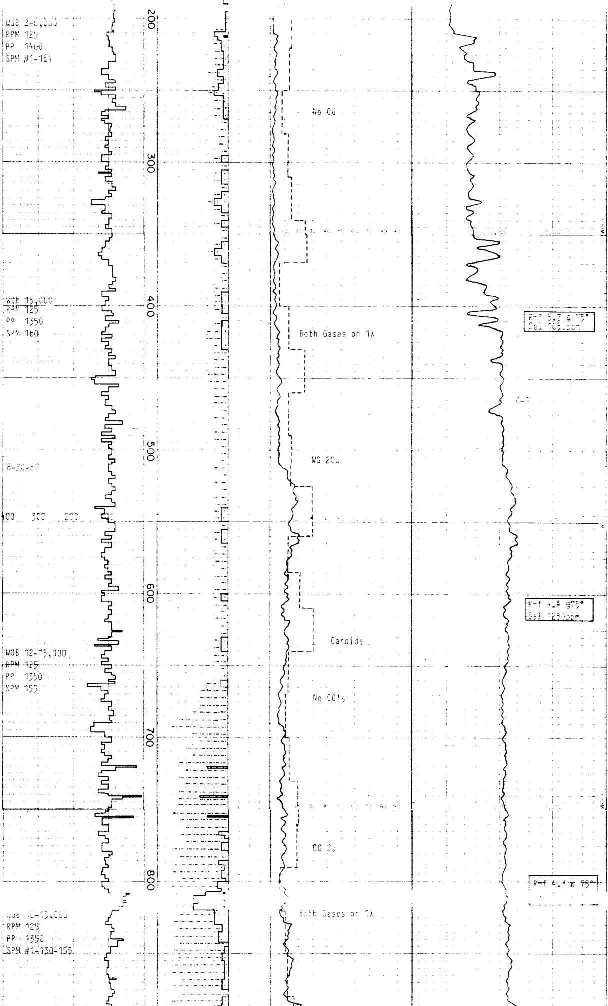
Clay: lt to med olv gry; soft; mod thick, even, pasty consis; fair cohes + adhes; pr to sli sol; silty; fn sand; [illegible] sli calc; [illegible]

Carbide Lag [illegible] min @ [illegible]
SPM-#1-142, 106% theor, 5 min cur

Siltstone: lt gry grn to olv grn; soft; v clayey, argil; v sml rnd homo ctgs; dull chalky lstr; gritty tex; grades from mudstn to argil v fn ss; variably calc; mica; carbonaceous; tr shell frags; no spl fl or bulk cuts.

Note: clay plugging off flowline.

Sand: [illegible]



abndt fines washing through sieve; no fl or bulk cuts.

Carbonaceous material: blk; fn gr; lignitic; soft; woody; fiborous; flaky; occ sandy; no fl or bulk cuts.

Clay: lt to med olv grey; glutinous + stky; gelatinous; washes poorly in sieve; nodular consist; vvfn diss sand; com carboraceous material grading from lignite to woody fibrous material; no oil indicators

Siltstone: pale yellowish brown to med olv grey; sl arras tex; no sphericity; v thiny lam; mod sft to frm; vvfn diss sand; shell frags; abndnt calc; no fl

Sand: clear, cloudy, wh; fldsp + qz; occ lith frags; ang; occ frosted tex; mod sphericity; com [illegible] sharp, ang flakes, laminated; calc; mod amt micromica; occ shell frags; no spl or blk fl

Clay: lt-med gry to olv grey; glutinous; mod nodular in sieve; stky; poorly soluble; bentonitic; wh to med olv grey siltstone occ shell frags; calc; ang + mass lig; no oil indicators

Sand: clr to cloudy + wh; occ sl alt to prple; ang frags; mod wl-srtd; well diss thru clay mtx; occ silver + gold micromica; lig; calc; shell frags; no fl.

Clay: lt olv grey; mod glutinous; sl pasty; mod sol; mod nodular in ctngs; diss wh to med olv grey siltstone, mod frm; com calc; tr lig; com shell frags; no blk cuts.

Siltstone: [illegible] yellowish [illegible] spherical [illegible] lig; [illegible] indicators.

Clay: [illegible] tr calc; tr mica; tr shell frags; no [illegible]

Siltstone: [illegible] frm; occ vfn lams in [illegible] mass; com small homo ctngs; [illegible]; tr calc; com carb incls grading to lig; no spl fl.

Marl: minor amts of lt brown to greyish orange; mod [illegible] com reish brn organic flakes; grades to [illegible] olv grey siltstn; [illegible] cuts.

Survey @ 507': [illegible]

Wipe Hole @ 507': tight @ [illegible]

Clay: [illegible] occ thin stringers of vvfn sand; organic frags-lig-thruout; occ occ shell frags; no oil indicators.

Siltstone: mod to dark yellowish brown; small homogeneous ctngs; comnly vfnly laminated w carb incls; gol + silver mica; tr y'low brown marl; tr glauc; shell +foram frags; no fl.

Lignite: v dark grey to black; hd to fri; blocky to ang frags; comnly v thinly laminated; occ mass; com lt to mod yelo brown siltstone; tr vgt mica; occ shell + foram frags; no fl; no cuts

Carbide Lag 5 min @ 632', 64u
SPM #1-160 76% theor, 4mn dur

Clay: mod olv grey; sft to mod sft; lumpy consist in sieve; stky; gelatinous; bentonitic; lt yellow brown marl; vgt mica; com mod yellow brown siltstone; tr shell frags; tr glauc; no oil indicators

Sltstone: mod brown to dk yellowish brown; platy ctngs, mod small + homogeneous; argill; occ v sl sandy; occ alt volc products; sl tr calc; lt yellow marl frags; tr lig; no fl

Pyrite: [illegible] occ ss bns, v clctc, w botryoidal casts; wh to pink; no fl

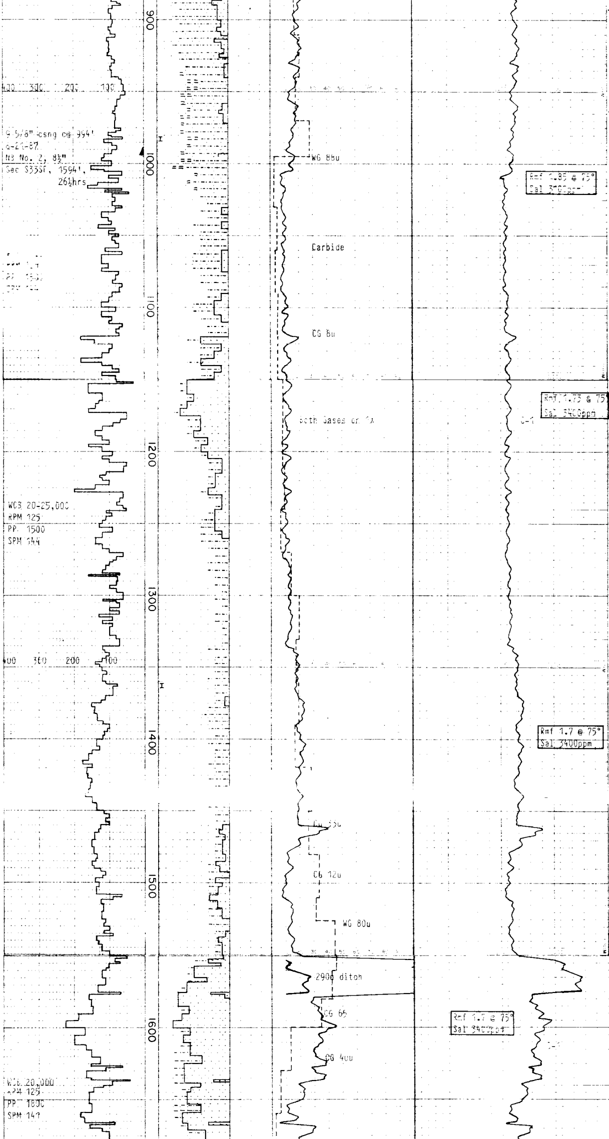
Siltstone: brown; occ orbicular incls; aphanitic; argill; occ sl lam; mostly platy to blocky ctngs; fri to bd; diss lig; tr shell frags; diss pyr; sl tr brk red tdf; no oil indicators.

Sandstone: lt olv gry matrix w dk grn grains; fn to crs occ grans to 4mm; poss glauc, poss weathered ultramafic meta clasts; sbrnd to sbang; v prly srtd; calc cmtd; occ frd, com [illegible] silty); [illegible] red and tan [illegible]; tr shell frags; occ dissem interstitial pyr; occ mica; no fl or bulk spl cuts.

MW 9.4 VIS 48 PV 15 YP 12

FL 6 pH 8.8 Cl- 700ppm

Siltstone: lt olv gry; mod soft to well firm; sml blocky to sbrnd homo ctgs; dull chalky lstr; sli smooth to grainy tex; varibly sandy; occ fn glauc; rare shell frags; rare mica; grades from silty mudstone to silty ss; sli calc; no fl or oil shows.



Sandstone: lt olv gry; mod firm; argil; matrix supported; fn to tr med; glauc; sbrnd to sbang; pr ppr; qtz, fspr; tr mica; rare shell frags; grades to sandy sltstn; structureless; no fl or bulk cuts.

Note: Traces euhedral pyr w ss

Mudstone: v lt olv gry; firm; v sml blky to sbang ctgs; homo; sli crunchy; pure to silty grds to argil sltstn; rare forams; tr glauc or reworked, weathered ign/meta; sli calc; no fl or cuts.

Clay: grnsh gry; soft; bcmng thkr; mod even, sli lumpy; runny; mod pr cohes + adhes; silty; sandy; mod solu; sli calc; tr shell frags; no sheen or pops.

Wipe hole @ 996', abndt clay on bit + collars swabbing hole.

Note: Break mud over to polymer system.

MW 9.6 VIS 4[illegible]

Clay: mod olv gry; sft; soluble; [illegible] brown [illegible] sandy [illegible] shell frags; no fl; no cuts.

Carbide Lag 9 min @ 1060', 127u SPM [illegible] 8% incr, 4 mn dur

Siltstone: mod brown to dk yello[illegible] [illegible] calc; occ mod yelo brown mud stone; no oil indicators.

Sandstone: wh, clr; vfn to fn; mod wl cmtd; prly srtd; sbang [illegible]; comnly alt to dk green; v calc; shell frags; brown argill siltstone w diss mica; mod amt muscovite; tr lig; forams; occ gastropod frags; tr pyr; no pops; no cuts.

Sand: [illegible] srtd; clear, unconsolidated; [illegible] green; muscovite; [illegible] mod amt lig; [illegible] stringers; no fl.

Clay: lt to mod olv gray; kaol; sft; mod sol; mod stky; [illegible] consis; musco; pyr; tr shell frags; occ alt vlcs; tr brick red tuf; lar brown siltstone; no oil indicators.

Siltstone: med olv gray; small semi-blocky to lam ctngs; mod sft; argill; occ grading to sandy siltstone; com wh bn frgs; calc; mod amt musc; fram + eu pyr; lig; sl tr brk red tuf; no fl; no stains.

Marl: cream to v pale orng; mod sft; mod discoidal ctngs; v calc; com vfn diss organic debris; tr rust stning; tr lam, but ctngs mod blocky in part; tr shell frags; fram pyr; occ wh sand grs; brown argill siltstone; no no fl; no cuts.

Clay: mod yellowish brown to brn; mod stky + glutinous; sl gelatinous; mod sft; v sol; v sl pasty; v pale orng marl w carb incls; brn sandy siltstone; broadly diss pyr; occ shell frags; sl tr red brick tuf; tr lig; no fl

MW 10.0 VIS 43 PV 18 YP 14

FL 7.4 pH 11.1 Cl 800

Marl: pale orngish brown to wh; sft; semi-discoidal ang ctngs; mod homogeneous; diss lig; tr glauc; rr alt vlc frags; occ shell frags; occ sl alt siltstone frags; calc; sl tr diss pyr; tr mica; no pops; no blk cuts

Limestone: org gry; mod hrd; sml blky, homo ctgs; dull resideous lstr; mod smooth tex; argil; grds to marl; occ free calcite as vein filling; no stns or cuts.

Clay: lt to med olv gry; soft; mod lumpy, thick + thin, smooth consis; fair cohes + adhes; greasy; sli sticky; pr solu; sli silty; sli calc; noncalc; sli expandable; no pops or sheen.

Siltstone: olv gry to olv brn; mod soft; sml to med sized homo ctgs; dull earthy lstr; v argil, grades to silty mudstone; [illegible] calc; [illegible]

Note: occ traces euhedral pyr xstl clusters.

Sand: clr, cloudy, tr wht; v fn to occ med; sbang; loose; fair spher; dom qtz; fspr; comm free calcite; tr euhed pyr; tr carb mat; tr altered basalt; tr altered tuff; tr kaoln clay; mica; no fl or bulk cuts.

Sandstone: lt gry; well cmtd; fn gr; pr srtd; matrix supported; pr por; calc cmtd; qtz; fspr; mica; tr carb mat; occ v fn euhed interstitial pyr; kaoln; structureless; no fl or bulk cuts.

wiper Run @ 1527', tight @ 1[illegible]'

Survey @ 1513', 1°30'

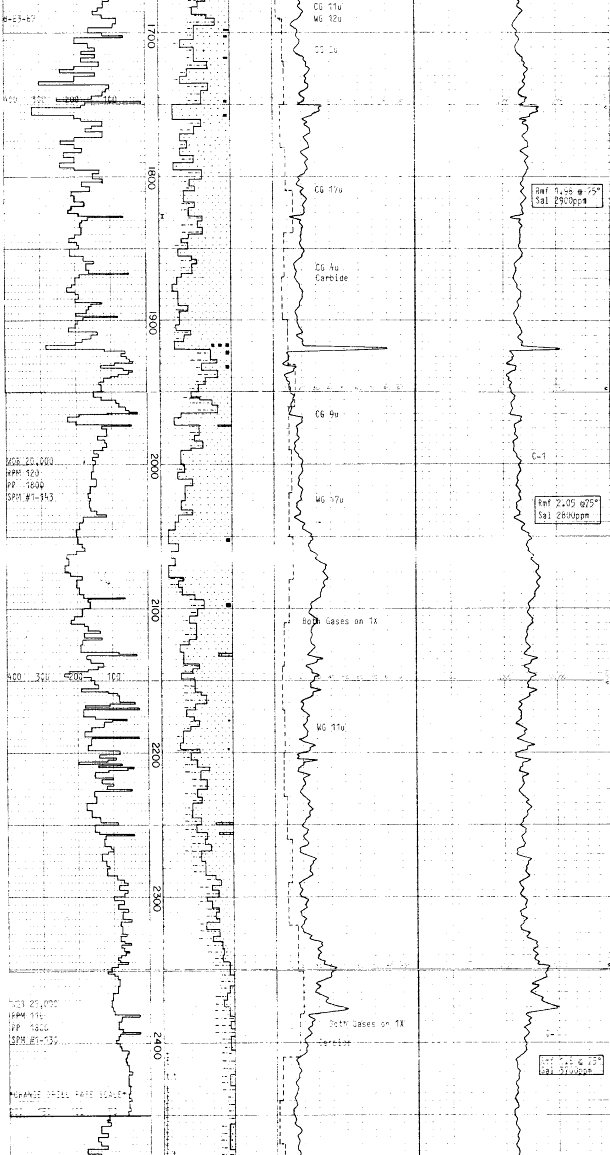
Sandstone: lt gry; firm to fria; fn to occ med; v ang; v calc cmtd; pr srtd; fair por; clean; immat; qtz + fspr; abndt randomly oriented mica; chlor alts; kaoln; abndt euhedral pyr. to 2 mm; tr org ign crs; occ free calcite; no oil fl or cuts.

Note MW cut from 10.0 to 9.9

Note: abndt euhedral pyr xstl clusters, 1% of spl.

Shale: grysh brn; mod firm to soft [illegible] silty; calc; dull earthy luster; gritty to [illegible] calc; occ sandy; [illegible] micaceous; grades to argil siltstone; no fl or bulk cuts.

Sand: wht to cloudy, clr tr or [illegible] loose w equal sml [illegible] ang [illegible] qtz + fspr [illegible] carb mat; no sol fl or bulk cuts.



Clay: [illegible] yellow brown to brown; [illegible] con- [illegible] mod insol; [illegible] ss w [illegible] shell [illegible] ranging [illegible] abndt

Mw [illegible] VIS [illegible]

FL 5.0 pH 10.0 Cl 900

Sand: clr, occ cloudy, to wht; sbang to sbrdd; mod w/srtd; occ dirty; yellow brown to brown siltstone; shell frags; abndt lig, cl, fri, laminated; musc; calc; occ alt ign frags; no oil indicators.

Sand: [illegible] fn to med; loose; sbang; [illegible] srtd; [illegible] calc cmt attachments; [illegible] abndt qtz; continued fair amts [illegible] euhedral pyr; mica [illegible] carb mat; [illegible] chlor; no spl fl or bulk cuts.

Siltstone: [illegible] firm to soft; [illegible] argil; [illegible] fn sandy; [illegible] tr forams; rare broken shell frags; grades to silty, sandy mudstone; no fl or cuts.

Clay: lt gry to lt olv gry; v soft pasty, even, sli sticky consis; v gritty tex; fair cohes + adhes; mod solu; mod calc; dom kaolinite; tr lignite; tr shell frags + forams; no pops or sheen.

Carbide Lag 10.6min @ 1871', 121u
SPM #2-143, 92% theor, 6min dur

Sand: cloudy, wht, clr, tr gry + grn; v fn to occ med; sbang to occ sbrnd; pr srtd; immature; dom loose; dom fspr, lesser qtz; occ lithic grs; comm free calcite as matrix cmt; occ kaoln; tr carb mat; mica; occ chlor alts; comm interstitial euhedral pyrite; no sp. fl or bulk cuts.

Lignite: grading to peaty carbonaceous material; mod firm; brittle to soft + spongy; mass to v thinnly lam; occ sli fiborous; occ pyritic; no fl or cuts.

Mw 10.0 VIS 42

Shale: lt yelsh brn; mod firm to dom soft; v sml, homo, sbrnd ctgs; occ v sli fiss, dom mass grdng to mudstone; silty; sli calc; comm altered foram tests; tr mica; structureless; no fl or cuts.

Sandstone: lt gry to wht; v fn to occ tr med; dom soft + mod fria; dom argil; sbang; v pr srtd; calc; abnct kaoln alts; fspr; qtz; mica; tr carb mat; dcrs pyr; tr ign grs.

Survey @ 2020', 0°0C'

Wiper Run @ 2025'

Clay: lt gry; soft; pasty; sli sticky; even, curdly tex; fn sdy; mod cohesive; pr adhesion; pr plasticity; greasy feel; dom derived from high kaoln content of sand; sl calc; sli expandable; mod to pr solubility; no pops or sheen.

[illegible] grn; v fn to fn; sbang, tr sbrnd; mod srtd; dom loose; oc kaoln supported; dom fspr; lesser qtz; tr tuffaceous grs; mica; com lignite; dcrsd pyr @ 2080'; tr chlorite; occ free calcite; no spl fl or bulk cuts.

Shale: lt yel brn; firm to mod soft v small, homo to fnly lam ctgs; sbrnd to sli tab; silty; grades to softer mudstone; mod calc; tr forams; grades to argil sltstn; no fracs or oil shows.

Sandstone Bone: lt gry to wht; mod well indur; fn to low med; well calc.cmtd; sbang; pr srtd; gr + matrix supported; dom mod to v kaolinitic; fspr + qtz; occ blu gry tuff frags; carbonaceous; mica; dcrsd pyr; tr chlor alts; no fl or cuts.

Sand: gry, wht, cloudy, occ clr, tr grn; fn to tr crs; sbang to occ sbrnd; pr srtd; immature; incs in gr size + lithic content; dom fspr; occ qtz; tr tuff clasts; occ altered basalt grs; v mica; com calcite, prob as free matrix material; tr ls; tr chlor alts; com interstitial euhedral pyr; no fl or bulk cuts.

Siltstone: olv gry to olv brn; mod firm to firm; v small irreg shaped homo ctgs; v argil grading to silty shale; calc; tr forams; v fn sandy; micromica; tr carb mat; no fl or cuts.

Clay: bcmng more olv olv gry; soft; sticky, pasty consis; sli thick, curdly; greasy feel, bcmng drier + thicker overall; sli calc; mod expandable; dom derived from kaolinitic matrix and siltstone; mod pr solubility; no pops or sheen.

Mw 10.1 VIS 41

Shale: olv brn to olv gry; mod firm; small homo ctgs; mass; dull earthy lstr; smooth to sli gritty tex; silty; tr forams; sli calc; [illegible] grades to argil siltstone; [illegible] cuts.

Sand: [illegible] no spl fl or bulk cuts.

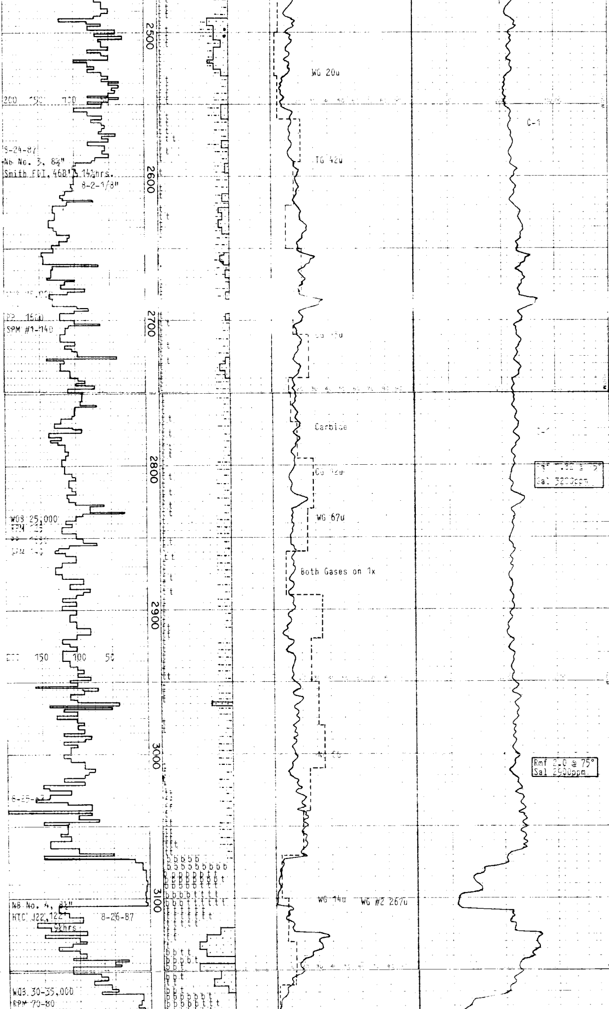
Clay: lt olv gry; soft; thick, v pasty consis; dry; smooth; v cohesive; adhesive; fair plasticity; homo; kaolinitic; silty; [illegible] pr solubility; mica; tr forams; assoc w occ translu, waxy [illegible] interlams; no sheen or pops.

Mw 10.0 VIS 39

Carbide Lag [illegible]min @ 24[illegible]', 200u
SPM #[illegible]-[illegible]30, 93% theor, 3min dur

Tuff: lt gry + blu gry mottled; [illegible] translu + opaque [illegible] waxy tex; altered to bentonite; swells upon rehydration; no fl.

Siltstone: mod to mod yellowish brown; v abras tex; mod spher + blockiness in ctngs; occ fine striations grading to laminations; med bluish grey tuff; abras tex; mod sft to mod frm; mod brite lustre; calc mtx; mod amt musc; cont tr lig; occ clr spher qz grs; no fl; no cuts.



Clay: lt to mod olv grey; stky; v cohesive + adhesive; glutinous; mod sol; silty; blu grey tuff; mod yellow brown siltstone; tr lig; calc; occ vvfn diss pyr in siltstone; no oil indicators.

Tuffaceous Sandstone: lt to mod olv gry green; alt; fn gr; tr; occ cglmeratic incls; v clctc; ang to sbrdd cmtd lithic + vlc frags; wide spread chloritization; lt yellow brown to mod brn bent siltstone grading to sandy siltstone; occ alt foram frags; no stns.

Survey @ 2526': 1° 0'; wiper run tite; ream @ approx. 2250'.

Tuff: lt green to mod grey green; mod sft to frm; polished + sb-rdd io ctngs w mod good spher-occ sl pinacoidal; com clctc striations in ctgs-laminae; mod rr finely eu + framboidal pyr; occ shell frags; abndnt calc; tr free xtln calc-trans; no pops; no fl.

MW 10.3 VIS 40 PV 17 YP 11

FL 4.6 pH 9.5 Cl-1200ppm

Siltstone: olv brn; mod firm to firm; v small sbang ctgs; homo; v argil, grading to silty shale; sli calc; com sandy; tr mica; orb carb mat; tr forams; tr w ss interlams; no fl or cuts.

Clay: lt olv gry to lt gry; soft; mod thick, sticky, pasty consis; excel adhes + cohes; even, sli curdly tex; sli greasy feel; silty fn sandy; calc; sli expandable; no [illegible] pops or stain.

[illegible] ctgs; argil; dull earthy to tr w sbvit lstr; smooth to gritty tex; occ fn sandy; occ w dispersed v fn disseminated pyr; no structure or fl; occ calc; no shows.

Clay: lt olv gry to lt gry (macro) lt blush gry (micro); mod thick; sticky; pasty; v cohesive + adhesive; tv sandy + silty; dom smooth homo tex; sli calc; poss kaoln; tuffaceous; sli expandable; no fl.

Tuffite: pl gry, pl blu gyr, occ yel wht; firm to tr hard; argil; sandy; w occ vitric shards; tr basalt pbls; varibly calc; dull chalky lstr; rough pitted tex; tr welded w sediments; tr calcite; occ pyrite; tr yel min fl.

Carbide Lag 15.6 min @ 2774', 175u
SPM #1-143, 100% [illegible], 3 min cur

Survey @ 2836': 0° 30'; wiper run tite; rm + cr @ 2200'.

Clay: lt to dk olv grey; stky; gelatinous; slimy; sl plastic w a trace of elasticity; silty; cont. sl amts blu grey tuff + tuffaceous siltstone; calc; tr diss pyr; tr micromica; no fl; no cuts.

Tuff: lt olv grey, lt to mod orng brn, lt to mod green, lt to mod yellowish pink; sucrosic tex; mod frm + fri; clctc; small [illegible] ctgs; sl tr pyr; no oil indicators.

Clay: lt to mod ol. gry; vv stky [illegible] sl coc- [illegible] consis; cont. elasticity; [illegible] sl gelatinous; [illegible] sbper in tuff ct- [illegible] tr py in fractures; no stns.

Mw 10.4+ VIS 47

Tuffite: lt to mod blu gre, pnk, [illegible] finely xtln [illegible] tr bst frags; tr fram pyr; tr calc; no [illegible] cuts

Siltstone: mod orng brown; argil; [illegible] striations [illegible] tuffaceous; [illegible] sl sectile; frm to hd; no fl.

Clay: mod olv brown; loose; sl stky; mod pasty; concelatinous; runny consis; bentonitic; amt of vgt tuff decreasing; increase in siltstone; wh qz bn @ 2955'; tr pyr; no fl no cuts.

Crystalline Tuff: steel blu, pinkish orng, wh, crm; vitreous lustre; sucrosic tex; mod spher grading to sbang in ctngs; frm to hd; brn siltstone is predom tuffaceous, also; no spl fl; no cuts

Siltstone: mod brown; mod brite lustre; rubbly tex, occ sbc; small [illegible] ctngs; sl striations; xtln appearance-tuffaceous; occ wh qz prs; tr calc; v sl amt vgt vgt tuff; no oil indicators.

Basalt: dk grey to blk; dense; v hd; occ v small plag phenos; ctings mod homo-v angular; calc filled fractures-wh, green, prpl; calc fl; no cuts

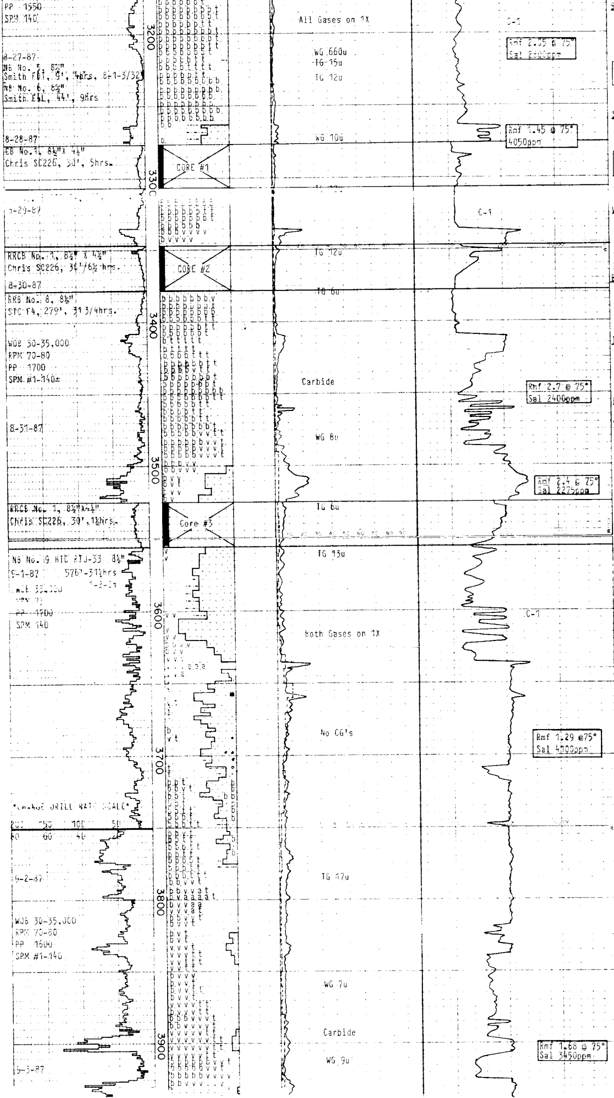
Note: Hole very tight RIH from 1660'.

Note: Raise mud weight to 10.7

Survey @ 3102', 0°30'

Sand: clr; ang; fn to vfn; poorly sorted; kaol mtx-v stky + gummy poss interbed; basalt interbeds-v hd, blk; no fl no cuts

Clay: v lt to mod olv grey; mod plastic; mod frm; mod stky-glutinous; vvfn diss sand throout; abndnt finely eu + fram pyr; tr wh mca; com basalt sills-dk grey to blk + v hd; no oil indicators.



Basalt: dk grey to blk; v dense; v hd; rudimentary flo tex; vit lustre; glassy groundmass; com biotite + magnetite; abndnt cl-ctc plag xtls; mod w/frac; lt green talc; poss apatite + augite; occ chalcedonic infill; v lt green calc xtls; poss pigeonite; occ sl min fl; no cuts.

Note: Bit #4 missing approx 42 buttons, RIH w junk-sub + NB #5

MW 10.8 VIS 44 PV 17 YP 13

FL 5.6 pH 8.5 Cl-1100ppm

Sand: clr, occ alt to lt yellow; ang to sbrdd; poorly srtd; vvfn; com mod fn grs; qz; occ rdd vlc frags; kaol mtx-mod frm + plastic; cont. abndnt bst frags in ctngs-slough; occ sl min fl.

Core #1: 3276'-3306'
Cut 30', Recovered 30'

MW 10.8+ VIS 44 PV 15 YP [illegible]

Volcanics @ 3340': basal basalts indicate varing degrees of weathering, incrsd vesicularity, occ green amygdules; becoming tuffaceous; red, clayey pyroclastic @ 3340'.

Core #2: 3347'-3377'
Cut 30', Recovered 30'

Basalt: dk gry to dk grnsh gry; occ mod lt gry; mod to hard; sml blocky to ang chips; dull to subvit lstr; rodgo, sharp tex; aphanitic; incrs siliceousness grades to andesite; often grainy + porous, prob bit shattered; tr soft 2mm green amygdules; occ devitrified and altered to kaoln.

Tuff: pl grnsh gry to lt gry; mod hard to dom firm; sml blky, sbang ctgs; aphanitic; com translu grn amygdules; bcmng ashy + lter gry @ 3420'; occ free calcite.

Carb Lag 26 min @ 3444', 91u,
SPM #1-142, 132% theor, 7mn dur

Kaolinite Seam: wh, occ lt to mod green; sft; v inconhes; upsilty; thin consis; mod sol; no fl.

Volcanics: mod to dk green,orng brn,dk grey,mod rd,wh; poss palagonite tuf; md sft to v hd; md vit lustre; suc to rugose tex; alt interbd-dom bst,sbdom kaol; ind ash,chlor,poss epidote; v fr hornblende xtls; no fl.

Sand: clr, lt green; vfn; occ tt; loose; prly srtd; sbrdd to sbang; good opacity; med brite lustre; kaol mtx; sl tr muscovite; occ fram + ed pyr; vgt vlcs-chloritized; no spl fl; no cuts.

Core #3: 3525'-3555'
Cut 30', Recovered 29'

Survey @ 3532: 1° 15'

Sandstone: clr, lt grnish grey, [illegible] cuts.

Volcanics: lt to dk green, dk gry, grnish brn,wb, red; com blocky to mod spher in ctngs; extensively alt-chlor; some tr of amygdaloid frmation; v hd; prob occrng in seams; no oil indicators.

Andesite:(a); lt grnsh gry; hard; aphanitic; dull matte lstr; holocrystaline; sli vesicular w occ grn amygdule infilling.

Sandstone: wht; mod firm to por fria; fn to low med; ang to sbang; pr srtd; immature; dom clean; occ diagenetic clay; fair por; pl-fspr, qtz; rare dk minerals; com carb mat, lignitic; tr euhed pyr; no fl or cuts.

MW 10.8 VIS 50 PV 18 YP 14

FL 5.7 pH 7.5 Cl- 1150ppm

Clay: lt gry changing to med olv gry below 3700'; mod thick, sli pasty, curdly tex; mod sticky; mod solu; fair cohesion + adhes; sandy; silty; noncalc.

Basaltic lapilli: blk- dom dk gry, sbrdd basaltic frags; 1-4mm; often exhibiting evidencs of being reworked; occ w lt grnsh gry clay coatings; v rarely consol; qtz sandy; assoc w med gry clay; comm euhedral olivine xstls; tr pyr; com tuff matrix material;

Note: tight hole 3550'-3785',
kelly hose ruptured, jar + POOH
to check bit + replace kelly hose

Varicated Volcanic-v: maroon rd + gry grn mottled; firm; sml to med subang ctgs; dull chalky lstr; often wavy flow structure; com amygdules of basalt, occ altered to talc; noncalc; dom pulverized to mud + clay.

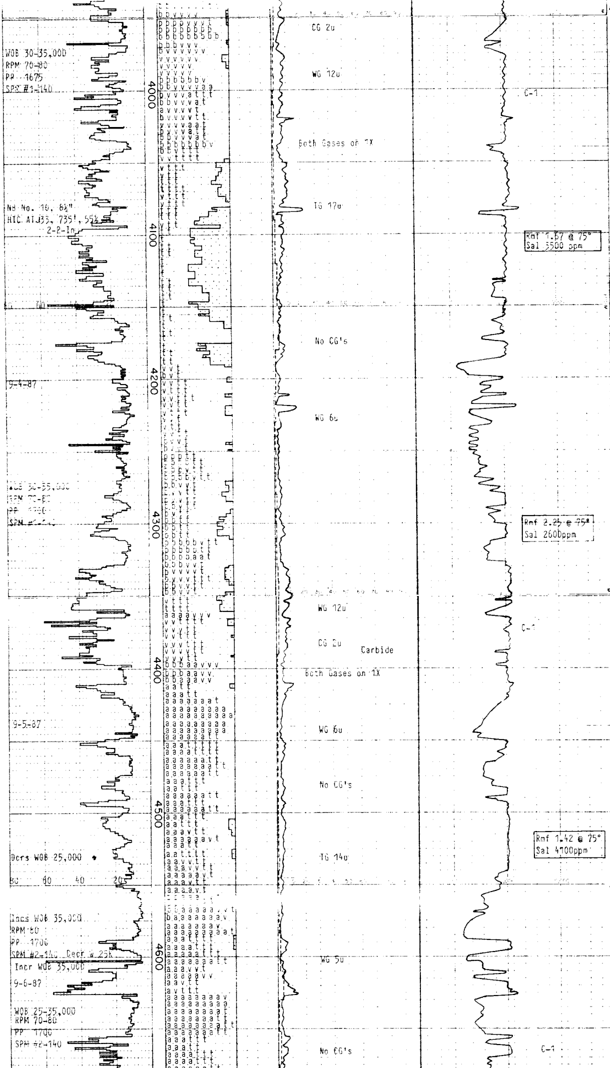
Welded Tuff: lt blush gry to gry, lt grnsh gry; firm; dom smooth, waxy tex; sectile; occ opaque w translu, wavy interlams; com as matrix w 1-3mm sized, ang,basaltic inclusions; grades to lt gry ashy matrix; tr grn xstl phenocrysts; dom converts to mud + soluble clay.

Wiper Trip @ 3861', pulled tight
at 3730'.

Carb Lag 33 min @ 3898', 54u,
SPM #1-140, 128% theor, dur 9mn

Sandstone: mod yellowish brown; vfn; sbrdd grs; mod frm; prly srtd; sl cmtd; fair p + p; ang frags of lt green volc glass; cont. vgt volcs, dom mod to dk reddish grey; bst frags; no fl.

Wipe hole @ [illegible]: tite @ [illegible].



green; hd to v hd; microlaminae + occ amygdules; rough, abras tex; vit lustre; small spher ctngs w ang edges-homo; occ alt kaol + yellow brown clay; no oil indicators.

Sandstone: wh, lt yellowish grn, lt green; mod frm; dom qz; vfn; sbrdd grs; clcic mtx; vgt vlcs interbedded w basalt flows; no fl; no cut.

Andesite: lt olv grey; vbd; ang to blocky ctngs; occ chloritized hornblende + pyroxene xtls; cont vgt volcs + palagonized + chloritized clay; no fl.

MW 11.0 VIS 47 PV 12 YP 17

FL 5.6 pH 7.7 Cl- 1000ppm

Basalt: interbed; dk gry; hd; ang, blky ctgs; apanitic; dull shiny lstr; occ alts to talc; holoxstln.

Tuff: lt grysh grn, occ pl grn; soft; clayey; sold; sandy, poss sedimentary; occ seen as coatings on sbrdd basaltic frags-reworked? -brecciated?; dom drills to clay.

Survey @ 4081', 1¼°

Sandstone: clr; vfg to fg; mod w/consolidated; vit, brite lustre; small, homo blocky ctngs; prly srtd; ang grs; poor spher; abndnt eu calc; gold mca + poss carbonaceous mat com in mtx; no tr pyr.

Note: Ch Mud Parameters: MW 11.1, VIS 40, Pv 13, YP 7, FL 4.8, Ph 8.1, Cl 1100

Clay: wh, lt green ashy; pasty; sl cohesive; nonadhesive; gritty; freq mottled brown + wh; exc expansion qualities; mod stiff; tr fram pyr.

Basalt frags: dk grey, dk reddish brown, dk greenish grey; mod frm to hd; smooth to rugose tex; occ v good sphericity-prob pbls; of- highly calcified + chloritically altered.

Tuff: lt green, yellowish brown, occ blue, mod red; crnchy-ashy to frm; small homo mod spher ctngs; occ semi-opaque; dull to sbvit lustre; rough, occ rugose tex; dom alt; occ spher incls.

MW 11.1, VIS 45, Pv 13, YP 14,

FL 4.9, pH 8.0, Cl 1200

Basalt: flow; dk gry; mod hard; ang, sharp ctgs; apanitic; occ altered soft grn amygdules; occ altered and fractured.

Tuff: grn gry to pl grn; soft; dom clayey + soft; occ consol as matrix material supporting basalt frags; com calcite + occ glass shards; occ sandy; tr translucent waxy and sectile.

Ash: wht, pl grn, lt gry; soft; solu; sli calc; silty; occ lam; non-expandable; becoming red orng and grn @ 4335'.

Sand: wht, clr, grn, blk + gry; fn to up med; dom ang; pr srtd; dom loose; com calcite; qtz; fspr; com transp grn amorphous min.

Wiper Trip @ 4359', tight @ 4220'

Carb Lag 38 mn @ 4389', 86u, SPM #1-144, 131% theor, 9mn dur

Clay: lime green, dk red, wh, orng brown; mottled; gritty; stiff; v cohesive; sl adhesive + expandable; mod plastic; pasty consis; mod sol; no oil indicators.

Andesitic Basalt: mod to dk olv grey, blk; hd; v dense + aphanitic grading to microltic; dull to occ vit lustre; rudimentary laminae; mod amt ash, crnchy, sl alt; tr chlor; tr calc.

Andesite: dk olv grey, olv blk, brownish blk, greenish blk; hd; mod lrg flaky ctngs; dull to mod vit lustre; rough to sl sucrosic tex; occ tr flo banding; freq microlitic w xtls alt to chlor; mod amt volc glass: pale green + translucent.

Wipe Hole @ 4444'; tite @ 4220'

Tuff: brick red; dull lustre; mod sectile to crnchy; smooth tex; vfn blk incls; dense fabric; top @ 4449'.

MW 11.2+ VIS 41 PV 14 YP 7

FL 5.0 pH 8.25 Cl-1150ppm

Survey @ 4515', 3°30'

Wiper Trip @ 4530', pulled free

Andesite: dk gry to occ blk; hard; basaltic, grds to basalt; blky, ang ctgs; apanitic; grainy tex; [illegible]

Tuff: [illegible] a slt, thin, v soluble clay; dull, earthy lustre; com platy laminae traced w a blk oxidation prodct; quite dense; occ sl xtln.

Survey @ 4595': 3° 15'

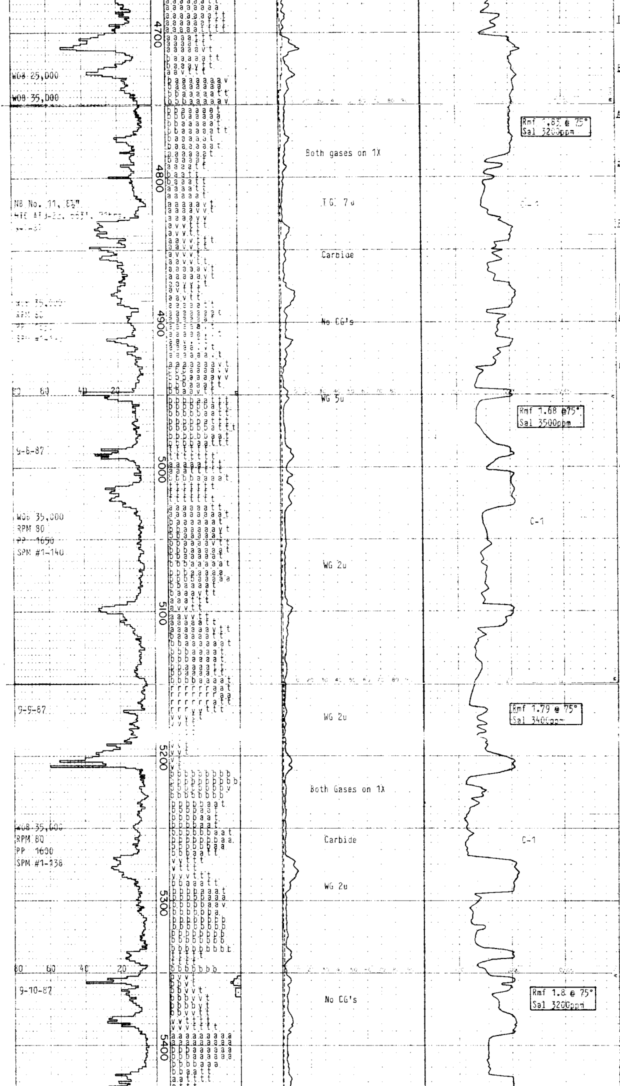
Wipe Hole @ 4605': free

Note: vary WOB to control drift.

Clay: brick red, dk reddish grey, mod grey; stiff; v cohesive; v adhesive; thin to exc consis; occ v soluble; grades to fri tuff w platy structure; tr volc glass; tr chlor.

Andesite: mod to dk olv grey; hd; commonly frac + alt; occ greenish grey; sl vit to dull lustre; rugose to rough tex; occ alt px-plag xtls; aphanitic grading to microlitic w occ phenocrysts.

MW 11.4 VIS 40 PV 15 YP 7



FL 5.4 pH 8.95 Cl- 750ppm

Tuff: varible, pl to grysh olive grn, occ maroon, first occ of pl purple; firm to soft + solu; smooth to rough + hummocky tex; comly vitric; com basalt lapilli altered greedstone; com translu grn hexagonal phenocrysts.

Basalt: dk gry to dk olv gry; v hard; aphanitic; microxstln; blky to flky ctgs; homo; rare soft grn inclusions; silic, grding to andesite; occ calc veins.

Andesite: med to dk gry; varibly hard; aphanitic; equigranular; rare aqua glass phenocrysts; [illegible] alts; occ fracs w [illegible] com [illegible] + mod friable and occ ashy rx.

Basaltic Andesite: mod to dk grey; grades to [illegible] w calc, chlor, tr serp, qz, tr pyr, poss epi- [illegible] abras tex; freq [illegible] mod [illegible] fracs [illegible].

Survey @ [illegible]

Pumice Tuff: [illegible] lapilli; [illegible] gry grn [illegible] to sl [illegible] mott- led; tuff [illegible] ashy + gry. kaoln; soft; solu by 4860'.

MW 11.1+ VIS 43 PV 15 YP 9

FL 5.6 pH 8.6 Cl- 1100ppm

Carbide Lag 47 min @ 4 [illegible]', 65u
SPM #1-136, 146% theor, 9 min dur

Andesite: dk gry; w occ [illegible] amyg- dules, [illegible] v hard; aphanitic; blky to [illegible]; occ altered to serp [illegible] fracs; occ calc linings com ashy interbeds and [illegible] tr devitrification; occ interbeds of pyroclastic lapilli.

Basalt: dk grey to [illegible]; melanocr- atic; v hd; abras, [illegible] tex; vit lustre; grades to micrlitic, sl micaceous andesite; com devit- rified ash interbeds w occ sl tr tuff.

Tuff: mod orng pink, pale yellow- ish brown, brick red, v pale or- ange, lt blu green, pale red purple; dull to hypoxtlo lustre; waxy tex; brn frags v platy; pro- bably vein + frac filling as well as v thn interbeds; calc; occ biotite; freq micaceous.

Andesite: mod to dk grey, occ alt to greenish grey; hd; platy to blocky ctngs; dull + comnly vit lustre; occ aphanitic grading to microlitic; com volc glass frags in xtln groundmass- trans yellow + pale green; eu calc; tr diss pyr.

MW 11.1+ VIS 43 PV 13 YP 7

FL 5.6 pH 9.0 Cl- 1100ppm

Clay: yelsh gry; soft; v thin, even consis; pr cohesion + adhes; solu; noncalc; becmng red during faster drilling tuffaceous zones.

Wiper Trip @ 5072', pulled free

Survey @ 5072', 2°00'

Varigated Volcanics: red brn + grn, occ wht ashy alts; firm to soft; mushy to sectile tex; clayey; rr calc; occ brick red lapilli; dom pulverizes to red clay.

Volcanic Glass: trans, pale yel- low, pale green, black, occ cloudy; conchoidal frac; vit lus- tre; shiny tex; hd + v brittle; occurs as frac lining + amorphous masses in microlitic groundmass; occ devitrified to chlor or kaol or poss palagonite.

Diorite(r): dk gry, grnish gry, pur- ple, mod brown; mod frm to hd; vitrophyric grading to porphyr- itic; com holohyaline groundmass; abdnt [illegible]

[illegible]: [illegible] greenish grey, [illegible] mod sol; mod frm [illegible] cohesion; mod adhesive; [illegible] mod consis; occ sl pasty; red tuff + volc grs.

Basalt: dk grey to blk; occ trans: vit lustre; rough, abras, occ rugose tex; dom aphanitic, occ grading to porphyritic; [illegible] glassy, almost a vitrophyre; vhd + brit- tle; occ augite xtls- alt in part.

MW 11.1 VIS 40 PV 14 YP 10

FL 5.7 pH 8.8 Cl- 1100ppm

Carbide Lag 50.5 min @ 5259', 45u
SPM #1-138, 142% theor, 9 min dur

Wiper Trip @ 5291', pulled free

Basalt: dk grnsh gry; v hard; mod dense; aphanitic to microxstln; blky; dom holoxstln; occ pheno- crysts altered to serpentinite; dcrsd to rare glass; com fractrd w calc and serp linings; occ ashy and poss devitrified.

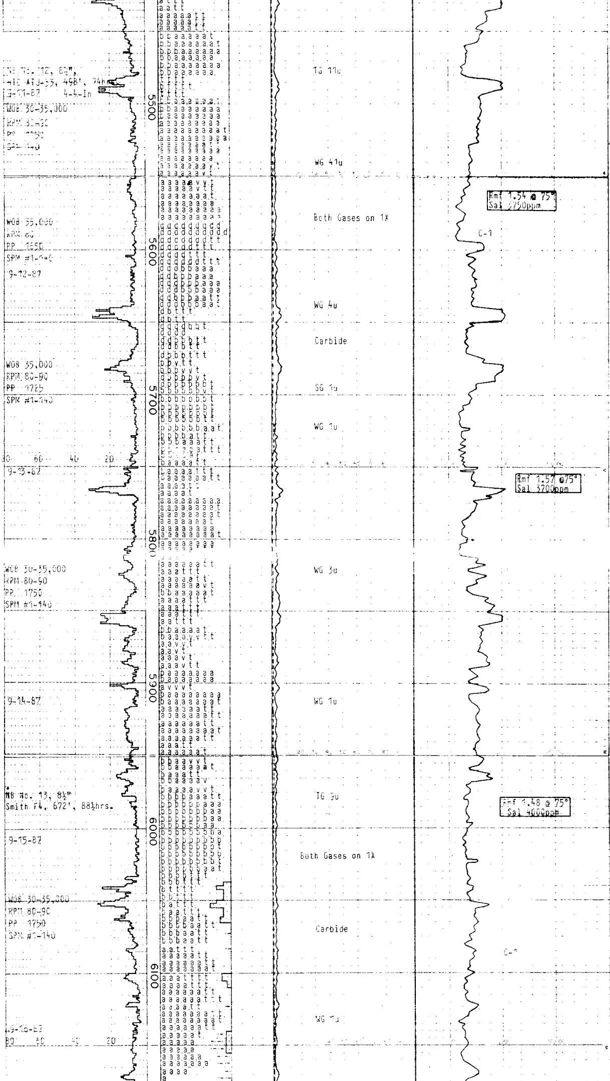
Clay: brick red, occ wh to lt olv grey; poorly sticky; v sl cohes- ive; thin to mod stiff consis; prob comminuted tuff due to bit action.

Sand: clr, occ milky grs; vvfn; sbang to sbrdd; poorly srtd; mod tite, occ loose; qz; mod poor o+p; abndnt alt volc grs-mod spher, vgt, hd; stiff, ashy clay.

MW 11.1, VIS 47, PV 18, YP 9,

FL 5.6, pH 8.6, Cl 1200

Ash: lt gry overall, faint grn ± rdsh brn mottling; v soft; med sized rndd ctgs; dom mottled occ swirled + v fntly lam; occ v blk mineral speks; kaolinitic; sli calc; rare as v thin, pure inter- lams within basaltic rx.



Tuff: red brn; mod soft to firm; pyroclastic; occ vesicular; [illegible] chalky lstr; [illegible] dom pulverized to clay; [illegible] as lapilli.

Andesite: [illegible] v hard, dense; [illegible] ctgs; microxstln; [illegible] appears basaltic grading to leuco-basalt; occ fractured w calcite + serp fillings; occ devitrification + alterations.

Survey @ 54[illegible]

MW 11.2, VIS 45, PV [illegible]

FL 5.5, pH 9.[illegible]

Andesite: dk grey to dk [illegible] hard, mod dense, [illegible] amygdaloidal [illegible] veinlets [illegible]

Volcanics: com variegated, [illegible] altered, tuffaceous; [illegible] soft + clayey; [illegible] occ wht plag phenocrysts; [illegible] mod calc; no fl.

Diabase(d): dk grey, blk, [illegible] itic tex; occ labradorite w schiller; abndnt plag; augite mesostasis; dom porphyritic; occ alt; ash + calc infill.

Andesitic basalt: lt to dk grey, greenish grey, hd to v hd; occ aphanitic, dom ophitic, some evidence of pilotaxitic tex; sl com var fr bst to and; com porph-lrg plag + px xts in microlitic groundmass; cont. ash + calc infill; occ alt rinds surrounding lrg eu to subhedral plag xtls.

Clay: green, pnk grey, mod brick red, occ wh; mottled; v stiff; not v adhes; mod cohes; pasty; sl waxy; ashy consis; volc frags-rdd to ang + platy.

MW 11.2 VIS 47 PV 17 YP 12

FL 5.2 pH 8.4 Cl-1200ppm

Carbide Lag 57min @ 5665', 55u
SPM #1-138, 147% theor, 9min dur

Survey @ [illegible], 1°45'

Basaltic Andesite: [illegible] dom aph; occ porph w plag laths both alt + unalt; occ felty groundmass due to unoriented xtls; occ green to red clay + brick rd tuff; no oil indicators.

Clay: bright blue green, dull to mod brick red, occ wh streaks; mod to v stiff; mod to v soft; sl adhesive; gen poor cohesion; ashy + pasty; vgt volcs + tuff.

MW 11.2, VIS 46, P[illegible]

FL 5.8, pH 8.[illegible]

Andesite: lt to [illegible]

Wiper Trip @ 58[illegible]

Ash: common lt to med gry; soft; med sized rnd, spherical [illegible]; faint red + grn mottling; sli calc; clayey occ foliated laminated; kaolinitic; occ vitrified w clr glassy shards.

Clay: dk red, wh, lt green, com streaky; mod sft; sol; thin to mod stiff consis; abndnt vgt volc frags; occ eu to subhed calc xtls; mod com devitrified glass.

Andesite: lt to dk grey; com grades to basalt; v weathered; dom felty tex grading to subpilotaxitic; v frm to v hd; dull, occ vit lustre-altho dom devitrified; com calc; com plag xtls; sl [illegible] ceous.

Tuff: mod to dk brick red, blue green, mottled; com brecciated; occ welded; mod [illegible] ang ctgs; ang to [illegible] structure; weathered andesite: [illegible]

MW 10.9+ VIS 47 PV 16 YP [illegible]

FL 5.7 pH 9.3 Cl-10[illegible]ppm

Survey @ 5977', 1°45'

Basalt: mod to dk grey, blk, occ dk red; aphanitic, porphyritic; occ scoriaceous; hd to v hd; occ felty tex; occ microlitic, holohyaline; com flow lines, grading to platy structure; alt plag xtls; occ augite xtls; irregularly diss chloritization thruout.

Volcanic Glass: translucent to transparent, v pale yellowish brown, v pale [illegible] dk green, occ [illegible] purple; [illegible] v hd; conchoidal fracture; small, ang, homogeneous ctgs; occ grades to glassy basalt.

Wiper Trip @ 6040', pulled free

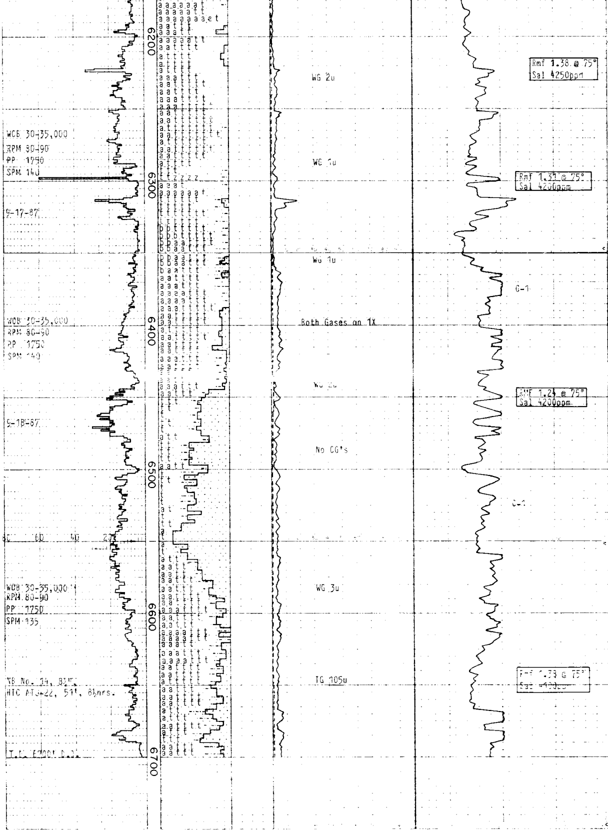
Crystal Ash: wht to lt grn, occ gry; firm to dom soft; clayey; mottled; w occ 2mm phenocrysts of plag, poss qtz; xstls com loose [illegible] ash [illegible] occ calcite; com euhedral pyrite.

Carbide Lag 64min @ 6072', 39u
SPM #1-136, 152% theor, 9min dur

Siltstone: traces; mod yelsh brn; soft; fria; v argil; fn sandy; sbrnd, homo ctgs; mica; tr lithics sli calc; grdes to silty [illegible].

Clay: pale green, lt yellowish brn; sli cohesive; poorly adhesive; thin to [illegible] consis; pasty; occ v sli silty.

Sandstone: [illegible] grs, mod [illegible] brown [illegible] poorly srtd; [illegible] v thn [illegible]



fl.

MW 11.0 VIS 45 PV 22 YP 12

FL 5.6 pH 9.4 Cl- 1200ppm

Lapilli Tuff: pl grn; soft; translucent; as matrix for com sbrnd, med gry basaltic lapilli; tuff is com altered to bentonite; occ plag + calcite.

Wiper Trip @ 6228', snug to 6068'

Vitric Tuff: pl grn; firm to occ mod hard; small, sub-blocky ctgs; opaque to transl; silky lstr; mod brittle; dom homo; tr wht tuff w scattered 2mm xstls; no fl.

Andesite: dk gry; firm to hard; dom as lapilli within tuff as evidenced by subrnd, elephant-hide tex + lt grn tuff coatings; occ blky w occ grn glassy phenocrysts; calcitic; aphanitic.

Wiper Trip @ 6290', snug to 6134'

Clay: lt olv grey, lt greenish grey, occ mottled wh; mod frm; sol; earthy to pasty; sl waxy tex; poss zeolite seam @ 6296': wh, fibrous, mod hd min; no fl.

Tuffite: wh, green, red, blue, lavender, purple; ind + bdd pyroclastic + sedimentary debris grading to a palagonite tuff; occ sft, com hd; silky to adamas tex; [illegible]; no oil indicators.

Wiper Trip @ 6353', pulled free

MW 11.0+ VIS 45 PV 20 YP 10

FL 5.5 pH 9.55 Cl- 1100ppm

Tuff: lapilli + xstl; pl grn to lt blush grn; tuffaceous matrix is soft + solu to mod hard + vitric; translucent to opaque; occ sli calc; abndt loose, subhedral plag, calcite, + qtz xstls w grn tuff matrix coatings; poss reworked; occ brecciated andesitic lapilli; occ alts, tr euhedral pyrite.

Clay: wh, lt to [illegible] pyr; calc; tr [illegible] fn to mod crs; tr [illegible]; no fl.

Sand: wh, trans, occ lt greenish grey; vfn to mod crs; sbang to sbrdd; poorly srtd; loose, becoming tite; blky, mod [illegible] crs; occ pyr; tr musc; abndt calc; cont. vol tuff + volc frags; no fl; no oil indicators.

Sandstone: clr, lt to mod orngish brown; pd; v abras; tuffaceous; vfn to fn grnd; calc cmtd; green + red tuff, and frags; occ subhed + fram pyr; no fl.

Mw 11.0, VIS 45, PV 19, YP 13,

FL 4.8, pH 9.5, CL 1000

Sandstone: wht + s+p; well indur to mod fria; med to low crs; sbang; mod to pr srtd; v tight, pr porosity; clean, gr supported; fspr, qtz; occ mica + basaltic crs; com loose; noncalc; poss sli silic; noscf.

Tuff: pl grn; soft to firm; opaque to translucent; w com andesitic lapilli; occ plag xstls; occ altered to bentonite; sectile; silky, waxy lstr.

Wiper Trip @ 6584', pulled free

Siltstone: mod yelsh brn; mod firm to dom soft; med sized, sbrnd, homo ctgs; v argil; fn sandy; grades to silty, mass shale; v sli calc; occ fn mica; tr chlor; tr v thin bivalve frag.

Andesite: mod olv grey, dk grey; v hd; dom aph, occ porph; blky; [illegible]

Mw 11.1 VIS 50 PV 16 YP 12

FL 5.2 pH 9.2 Cl- 900ppm

Sandstone: wht to dirty wht; com tan streaks; mod to lo crs; sbang; ticht; mod srtd; poor porosity; fspr; qtz; mica; tr lithics; occ free euhedral pyr; tr forams + shell frags; no fl or cuts.

Visual differentiation between basalt and Andesite was based on several criteria, stated in order of importance: Color, the basalts generally are darker due to their higher mafic composition. 2: Composition, the andesitic group being high in quartz generally contained lesser inclusionary minerals, b.e.g. augite and olivine and alterations thereof to serpentinite and chlorite. 3: Texture, the textures often displayed moderate variations generally with the andesites being more aphanitic, holocrystaline and the basalts being closer towards porphyritic with more of a merocrystaline texture. 4: Association, the presence of one rx type over the other was also determined by other rocks associated with the rocks in question. The more silicic the host rocks were the more tendency to place an andesitic name to the rock. In general the basalts graded to andesite and the andesites to basalts.