HORIZON WELL LOGGING

711 ST. Andrews Way
Lompoc, California 93436
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COMPANY	ENERFIN RESOURCES NORTHWEST
WELL	C.C. 12-02-65 ST#1 (Lindbleu)
LOCATION	570.79'N & 715.271'E f/W Qtr crnr Sec. 02, T6N, R5W, W.B.&M. X=1295520.9000, Y=875480.6000
ELEVATION	GL 908.80' KB 918.80'
FIELD	Mist
COUNTY	Columbia, Oregon
SPUD DATE	Oct 8, 1999
LOGGING DATES	Oct 14 to Oct 17, 1999
OPERATOR	Enerfin Resources Northwest
GEOLOGIST	Dave Huggins
DRILL REP.	Rob Lucas-Production Specialties
CONTRACTOR	Taylor Drilling Inc.
RIG	#7
MUD COMPANY	Jim Martin/Baker Chemical
MUD TYPE	Gel/Accu-Gauge
LOGGING GEOLOGIST	Jim Eastes, Mike Krahmer
BIT SIZE	9.875 in. to 480' 6.25 in. to 2863'
CASING:	12.00 in. to 30' 7.00 in. to 479'

CALIBRATION: 2% METHANE = 100 UNITS

ABBREVIATIONS

CO	Circulate Out
LAT	Logged After Trip
CG	Connection Gas
WG	Wiper Gas
TG	Trip Gas
SG	Survey Gas
NR	No Returns
NB	New Bit
WR	Wiper Run
CORE INTERVAL	
WOB	(100,000# full scale)
PP	Pump pressure
SPM	Strokes per minute

SYMBOLS

PEBBLES >2mm, SAND, SANDSTONE, SILTSTONE, MUDSTONE, SHALE, MARL, CLAY, LIGNITE, CEMENT, LIMESTONE, VOLCANICS, TUFF, BASALT

DRILL RATE	LITH	MINERAL	GASES	CHROMATOGRAPH	REMARKS
ROP 300 — 0 WOB 100K ···· 0		SHELL FRAGS, TUFF, ORGANICS, MICAS, GLAUCONITE, PYRITE	DITCH GAS, OFFSCALE, CUTTINGS GAS, OFFSCALE	METHANE, ETHANE, PROPANE, BUTANE, PENTANE	DESCRIPTIONS, SURVEYS, MUD CHECKS, MISCELLANEOUS

REMARKS

NOTE: All gases (CG, SG, WG & carbide) reported as above background except TG which is max units; spls described wet w/ color ref to GSA Rock Color. All depths based on drillers pipe tally. KB=0'

Begin logging from 43'.

SILTSTONE: lt gry grn-olv gry sft to firm, pred mass, sandy sections have com volc mafics altd to grn clay mnrls, r-mnr flecks of carb material loc assoc w/ pyr, at 90' incrs of tr-mnr shell fragments including bivalve frags, Dentalium, Bruclarkia columbiana, & Polnices washingtonesis. Local calcite rich layers.

CLAYSTONE: lt olv gry to olv gry, v soft to soft, mod soluble, grds to silty claystone, r shell frags, mnr carb material, occ calcite rich ledges.

SILTSTONE: olv gry, soft to mod firm, grades from occ silty claystone to v fn sandy, massive, tr-r carb v fn flecks, tr shell frags.

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CLAYSTONE: olv gry to med dk gry; friable to mod firm, grades from soluble to silty, no vis struct, tr carb matrl, loc shell frags, consistent green hue.

SANDSTONE: dk olg gry, gry-grn vfn-fnU, variably silty grdng to sltst; firm, tough ctgs; fnly abrasive; noncalc; spty shell debris; scat brn carbonaceous debris, tr org volc.

SANDSTONE: olv gry, subtly ltr hued; apprs sli "cleaner", incr fnU sd grains w/improved por; fnly abrasive; cont'd v firm ctgs but sli friable; com dk grn volc(?) w/tr glauc, fn carb mat & specks org volc.

SANDSTONE: cont'd sli ltr gry, decr grnsh hue of sltst; vfn-fnU, silty; sli fri to v firm blocky ctgs; wl srtd; qtz, fspr, scat rndd dk grn volc & glauc; spty fn shell debris, decr vis carb mat; incr loose sd in spls.

CLAY: dk gry-grn; sft pasty to sli gummy consistency; modly solu; lo-mod adhesion; derived f/crushed siltst; nonexpansive

LIMESTONE: (marl) pl yelsh brn v firm; dl lstr w/rough abrasive tex; sandy in part; vig rx w/HCL; incr sltst w/incr olv hue below marl; decr glauc.

SANDSTONE: dk olv gry overall w/clr to occ opq dk grn grains vfnL - fnU, variably silty, grdg to sltst; v firm to sli fri; wl srtd; spty lt-med grn volc & dk grn glauc; rr shell or carb; poss spty mica.

Drl 9.875" hole to 480' (14:00 10-9-99); 7"csg set @479'; drl out 14:45, 10-10-99.

SILTSTONE: med-dk olv gry, sli ltr hued than abv; v firm to sli fri where grdg to ss as above; rough gritty tex; spty fn "chunks" pyrtzd carb debris gd tr pl brnsh gry devit ash/tuff f/525', prob as thin lams sli tr glauc where sandy.

NOTE: chng mud over to "polymer" w/desco - slimey!

SANDSTONE: med-dk olv gry; vfn to medL, pred vfnU-fnU; sbang-wl rndd; modly srtd, cont'd variably silty; incr grain sz incr friable assoc w/sli incr grain sz f/550'; loc v com dk grn to org volc clasts; local tuffaceous lenses; tr shells

SANDSTONE: med olv gry, dk gry vfnL to fnU, silty; modly srtd mod indur, loc wl indur w/calc cmt f/disolu shell frags (633) cont'd silty; com volc debris/clasts; spty carb mat.

SILTSTONE: med brnsh gry, occ yelsh-brn hue; firm, "softer" than silty ss abv; sli sandy; dist incr fn carb debris below SS @633'; con'd but decr fn volc clasts; no shell debris.

SILTSTONE: med brnsh gry; sft, sli pasty to sli friable where sandy; blocky to rndd ctgs w/ appr incr clay in matrix; variably sandy but dist less so; brnsh hue f/scat fn carb debri (decr w/depth; noncalc, rr shell frags.

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SILTSTONE: med brnsh gry, occ subtle yelsh brn; firm, crumbly, bcmng sli more clay-rich, pasty; cont's variably sandy; incr fn carb debris f/640'; sand componet pred clr qtz, dk grn volc(?) clasts; rr shell frag, poss slough; incr solu clay in bulk spl w/depth.

NOTE: drill original hole to 2731'MD; BHL approx 108' @ N78.3'E from SHL. C&W showed small amt of pay; Decision made to sidetrack well to the North; KOP 818' (top of plug).

NOTE: sft, grnsh, sandy (fn-crs volc) sltst; brnsh, sndy (volc) Lmst (base Keasey); brn Sager.

CLAY: mod yel brn; sft; slk; pasty w/ gd adhesion; prly solu; wkly calc; com silt szd carb mtrl; tr mica.

CLAYSTONE: mod yel brn; v sft; occurs as elong & sbrnd cttgs; has good adhesion; loc v fn sand lam; com silt szd carb mtl; spotty silt szd mica; wkly calc.

CLAY: lt yel brn; v sft; assoc w/ abun nodules of claystone; slick; prly soluble; com v fn cldy sand; com v fn carb; occ mica; v wkly calc.

CLAYSTONE: lt yel brn; v sft; prly indurated; v wkly calc; frsh frac surf show com blk carb mtrl & spotty mica.

CLAYSTONE: note distinct color change f/ 975' to olv grn-olv gry; soft to pred firm; dull lstr but sl waxy when scored strng dcrs of clay; loc com silt szd to v fn blu grn volc grs; volc grs are sbrnd; tr carb mtrl; r mica; tr forams.

CLAY: olv gry; soft; mod sol; silty; pr adhesion; bcmg less plas w/ depth.

SILTSTONE: dk olv gry; firm to loc mod hd; prly-mod ind; dom argillic grdg to silty; no vis bed lineations; tr org mtrl; tr forams.

LIMESTONE: dk yel brn; mod hd; brit; micritic; dirty luster; grades to siltstone; tr carb mtrl; tr glauc.

MUDSTONE: med olv gry; firm; loc prly ind; incrsng sltstn in smpls; dull lust; v wkly calc; r glauc; persistent tr of v fn carb mtrl in rx.

SILTSTONE: med olv gry; prly to mod ind; incrs frm w/ dpth; lacks struct; grades to silty clyst; v loc calc; persist tr of volc frags; loc wht tuff frags; tr v fn carb mtrl thrgh rx; tr mica.

CLAYSTONE: med olv gry; med olv grn; firm to sft; cly mtx occ solu; no vis struct; tr of volc mtrl; persist tr flecks of carb mtrl & mica.

SILTSTONE: med-dk olv gry; frm to brittle; mod ind to loc pr ind; structurless; incr clyst w/ depth; loc tuff-rich zns; tr silt szd mica occurng poss cmt; steady tr of flecks of carb mtrl; spotty py, v r cc vns ass w/ py zns.

CLAY: med olv gry; sft; pr adhesion; mod solu; wkly cc.

CLAYSTONE: olive gry; brit; mod ind w/ incrs ind w/ depth; massive; lens of micritic ls @ 1267'; cont dcrs of sltst w/ depth; dull waxy lust; mnr r altd grn volc grs; loc tuff sand frags.

SILTSTONE: olv gry; v firm; mod brit; structureless; wkly calc; persist tr of v fn carb mtrl; r silt szd mica fnd on frsh frac surfs.

LIMESTONE: lt yel brn-gry org; mod hd; brit; micritic; assoc w/ strng tr of carb matrl & py.

POH @1350', L/D mudmotor

MUDSTONE: dist grysh brn, loc lt yelsh brn; mod to v firm, infreq crumbly to tough (apprs sli more solu w/incr pasty cly vs last hol;e); dl earthy lstr waxy when scored; v fn grainy tex; non to v sli calc; loc com pl brn calc tuff (tffcs marl?) lams; spty brn carb fleck & occ "sandy" volc clasts; apr massive, no appr bedd lin; spty foram.

TUFF: pl yel-brn to orgsh yel; hd, tough; matte lstr; vfn grainy tex; variably calc grdg to tffcs marl; v com as thin lams/lenses in mdst.

MUDSTONE: med grysh brn, sme yelsh-brn; firm to hd, sli crumbly to tough; pred tab to blocky; dl lstr, loc waxy w/ subtle trnsl uality (sim to silicic mud rocks); extrmly fn grainy tex; incr silty by 1500 w/thin sli-vfn volc debris; persist fnly dissem brn carb mat (imparts brn hue); com foram; spty pl brn tffcs mat; rr fnt varve-like lams.

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MUDSTONE: lt-med gry-brn to grysh yel-brn; firm to loc hd; crumbly to pred modly brtl, breaks w/snap; dl sli waxy luster; incr silty f/1500', spty grn volc clasts; tuffaceous in part; sli calc f/pinpt sources decr vis foram; loc com fn pl brn tffcs debris; incr tr prly developed partings (fiss); persistent pl brn calc tuff ctgs.

MUDSTONE: becms olv gry by 1590' dist decr brnsh hue; firm to v firm, sli crumbly to brtl; dl lstr, waxy when scored; incr vfn grn volc (glauc?) clasts appr give olv hue; pred brn hue by 1620'; NOTE strong tr calcite vein/frac fill 1620

CLAY: olv gry; firm gummy; pr solu; v gd adhesion - change!

CLAYSTONE: olv gry; firm-hd; pred brittle; fn argillic tex w/ zns of silt to sand sized grn volc grs; com tuff frags; mnr v fn py; v wkly calc.

CLAY: olv gry; v soft; dcrsg adhesion; incr solu; wkly calc.

BASALT: dk gry; hd; brittle; fresh; 1 vis pheno of olivine; abun py coatng frac surfaces; abun intst calc and com clr-trnsl vns (1-5mm); top of the unit is marked by a 1' thk, hd calc-rich clystn; v rare mottl cttgs of poss flt goug.

BASALT: dk gry; v hd; brit; porph; sl ves; brecciated; loc com org scoriaceous frags; com blue grn cly altd frags; mnr pyr on frac surfs; com vn & intst calc.

CONGLOMERATE: bulk spls dk gry w/sli bluish hue, pred cloudy gry to opq blu-gry, smr grn, org & wht; vfn to gran, pred fnU-vcrsL; ang to rr wl rndd; volcaniclastic (85%); crs-gran blu-gry basalt clasts w/scat org & wht tuff; scat fspr in fines; 5% yel-brn mdst clasts in top congl apprs "cooked" - fired clay; loc calc cmtd; cont'd v com pyr ovrgrwth on bslt clsts; rr fn shell debris

CONGLOMERATE: dk gry, bluish gry; vfn to gran; ang to rr wl rndd; sli incr silty med blu-gry cly in matrix(?); pred basalt clasts, 10-20% clr-cldy fspr, rr qtz; pred loose w/tr calc cmtd ss; scat calcite frags; slower ROP gen assoc w/ incr crs-gran clasts; decr but cont'd com pyr ovrgrwths.

CONGLOMERATE: pred as abv; incr crs basalt componet, fresher clasts, more ang; tr peach clrd calcite & calc mdst -1935

LIMESTONE: yel-brn; hd; 2'bed btwn congl & yel-brn mdst.

MUDSTONE: dusky yel brn to olv brn; pred prly ind cttgs; soft crumbly; up to 5% of smpl prly srtd volc & felsic grs; grs are silt-fn gr; mnr-com carb mtrl; mnr silt szd mica; r anhed py clumps; loc tr foram.

CLAY: mod olv brn; sft; slk & sl gritty; pr-mod solu; pasty w/ gd adhesn; expansi w/ HCl.

MUDSTONE: olv brn; sft to frm; incrs in prly srt sand & silt component; pred no vis struct; loc cttgs w/ sl align of carb mtrl in clay mtx; loose grs are sbang; persist v fn carb mtrl.

CLAY: med-dk olv gry; v sft; thick pasty consistency, bcms gummy when washed; lo to mod solubility; v gd adhesion; sli expansive; bcms incr silty/sdy

SAND: lt gry overall, pred clr to cldy; vfn-medU, pred fn; md wl srtd; appr as minor componet in cly/clyst, poss as lams v com fspr, spty fn grn clasts prob volc, poss glauc; com loose foram, tr brkn shells.

NOTE: unwshd spls bcm distinctly ltr hued f/2115' (olv)

MUDSTONE: lt-med olv gry; sft-sli firm; crumbly to sli ~~sec~~tile; hydrates to gummy cly; sli calc; spty mica, com foram & loose anhdrl pyr nods; decr silt/sd; subtle incr fn carb.

CLAYSTONE: lt-med olv gry; sft to sli firm; crumbly, occ flaky when brkn; v fn tex, redc silt; spty mica & loose pyr; loc tr thin marl lams/lenses; Clyst bcms olv gry-brn br 2200 w/incr carb content; v com pyr

CLAYSTONE: grysh brn to yelsh brn by 2220'; sft-firm, crumbly; incr tr v fnt brnsh lams; incr tr vfn-crs dk grn waxy rndd glauc(?) inclusions; sli decr anhdrl-sbhdrl pyr; clyst apprs incr organic rich.

CLAY: brnsh olv gry; v soft thick pasty consist, bcmg gummy when wshd; pr solu; gd adhesion; sli calc; mod expnsv

SILTSTONE: yelsh brn; sft to sli firm; grades to silty mdst apprs carb rich (incr brn hues f/2250); com foram, pyr nods, fn mica; calc ss @2301' vfn-medU, mod indur, com calcite.

SILTSTONE: yelsh brn bcmng dom grysh brn by 2350'; sft to sli firm; crumbly; fn grainy tex, com fnly dissem carb mat, org & grn volc; persist loose fn sd exhbt incr volc clasts; com anhdrl pyr, loose forams

CLAY: med olv gry, variable brnsh hues; v sft; thick pasty to gummy consist; prly solu; bulk spl incr silty, vfn sd.

SILTSTONE: med yel-brn; sft, crumbly to sectile; com vfn carb mat, foram, pyr; sli incr fn loose sd, dk grn waxy glauc

SAND: lt gry, clr to cloudy; vfnU to medL, pred fn; sbang - occ sbrnd; lo spher; wl srtd; pred loose, tr calc ss; arkosic w/com vfn mica, pyr aggs spty dk grn waxy pellets (as abv in sltst); ss assoc w/decr ROP's - 1-2' beds.

SAND: lt gry, clr-cldy; vfnU-occ medL, pred fn; sbang; lo spher; modly wl srtd; loose w/ tr calc cmtd ss; arkosic; com mica, tr volc; spty pyr.

SANDSTONE: wht, trnsl; vfnU-medL, pred fn; sbang; mod srtd ~~mod indur, sli fri~~; calc; arkosic; spty brn lig clasts w/ incr mdst @2485-90; v com pyr com musco/biot

SAND: lt gry, pred cldy to clr vfnU-occ medU, pred fn; sbang; lo spher; modly wl srtd; pred loose w/loc thin ss intrbds; arksc, com pyr mica, tr volc

TUFF: bluish gry; pasty clay to v firm, brtl tab ctgs; waxy sme flow struc; tr crs bslt sd

SAND: pl gry, cldy; vfnU-loc vcrsU (crs volc clasts below tuff thru 2575'); mod wl srtd loose; arkosic w/com mica, occ pyr (decrd); tr kaolin clay.

SAND: lt gry, incr clr; vfnU-medL, decr crs w/decr volcs; sbang; modly wl srtd; pred unconsol, loc mod indur ss lams/intrbds; arksc w/appr incr grn-sh gry muscov, spty fn pyr 1-2% dk volc clasts, clean.

LIGNITE: dusky brn, brn-blk; relatively sft, crumbly; dl to silky lstr; overlies dk brn carb-rich mdst

SAND: lt gry overall, clr to cldy; vfnU to occ medU, pred fnL-medL; sbang; lo spher, com tab fspr; modly wl srtd; loose w/loc tr calc ss; arkosic w/ v com mica (dom musco), scat fn pyr, tr volc clasts; com fn lig in spl w/brnsh hue to cly in unwashed spls.

SAND: lt gry, clr to cldy; fnL to medU, pred fn; sbang; lo spher; modly srtd; loose w/tr fri - mod indur ss; arksc w/ sli incr volc lith clasts; v com mica, bcmng dkr; assoc cly med olv gry (brnsh cly 2730-40) decr lig slough f/abv.

CLAY: brnsh gry (desco?) overall; v sft; thick pasty, gummy when washed; pr solu; sticky; bcms med olv gry by 2770'.

SAND: lt gry, cloudy-clr; fnL occ medU, pred fn; sbang; lo spher; wl srtd; loose; v com clr musco, incr to v com anhedral pyr nods; assoc clay lt olv hued.

SANDSTONE: lt gry wht; mod hd; snd sz a/a; mod-prly silica cmtd; distnct dcr in py, mica, & carb mtrl; sdstn bd overlies mfc lava @ 2840'

BASALT: dk gry grn; hd-mod hd; aphan; loc zns of grn cly altn ass w/ instit calc; tr vn calc; tr py.

TD @ 2861'MD, 20:30, 10-17-99