



BHP PETROLEUM (AMERICAS), INC.

WESTERBERG #1-34

SECTION 34, T15S, R40W

WALLACE COUNTY, KANSAS

A handwritten signature in dark ink, appearing to read "Lawrence C. Boucher". The signature is written in a cursive, flowing style with some loops and flourishes. It is positioned above a horizontal line.

LAWRENCE C. BOUCHER, GEOLOGIST

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WELL RESUME

Operator: BHP Petroleum (Americas), Inc.

Well Name & Number: Westerberg #1-34

Location: NE/NE/NE Section 34, T15S , R40W

County: Wallace

State: Kansas

Spud Date: 5/13/89 6:45 pm

Completion Date: 5/22/89 9:23 am

Elevations: GL- 3622' KB- 3632'

Total Depth: Drillers TD- 5300'
Loggers TD- 5301'

Contractor: Norseman Drilling, Inc. Rig #1

Type Rig: IDECO H 35

Pumps: #1 IDECO 550

Geologists: L. Boucher, M. Dodge

Company Man: Jack Parrot

Tool Pusher: Gene Hudson

Type Drilling Mud: Chemical

Mud Company: Davis Mud

Mud Engineer: Rich Steinbrink

Hole Sizes: 12 $\frac{1}{4}$ " 0-410' , 410'-TD 7 7/8"

Casing: 8 5/8" Set @ 403'

Mud Logging: None

Cores: None

DST Depths: #1 4944-4996'

DST Company: Wester Testers

E-Logs: Atlas Wireline Services, Dirk Becker

Type Logs: DIFL/GR/SP/CAL, BHC-AL/GR/CAL, ZDLC/CN/GR/CAL

Bottom Hole Formation: Spergen

Well Status: Plugged and Abandoned

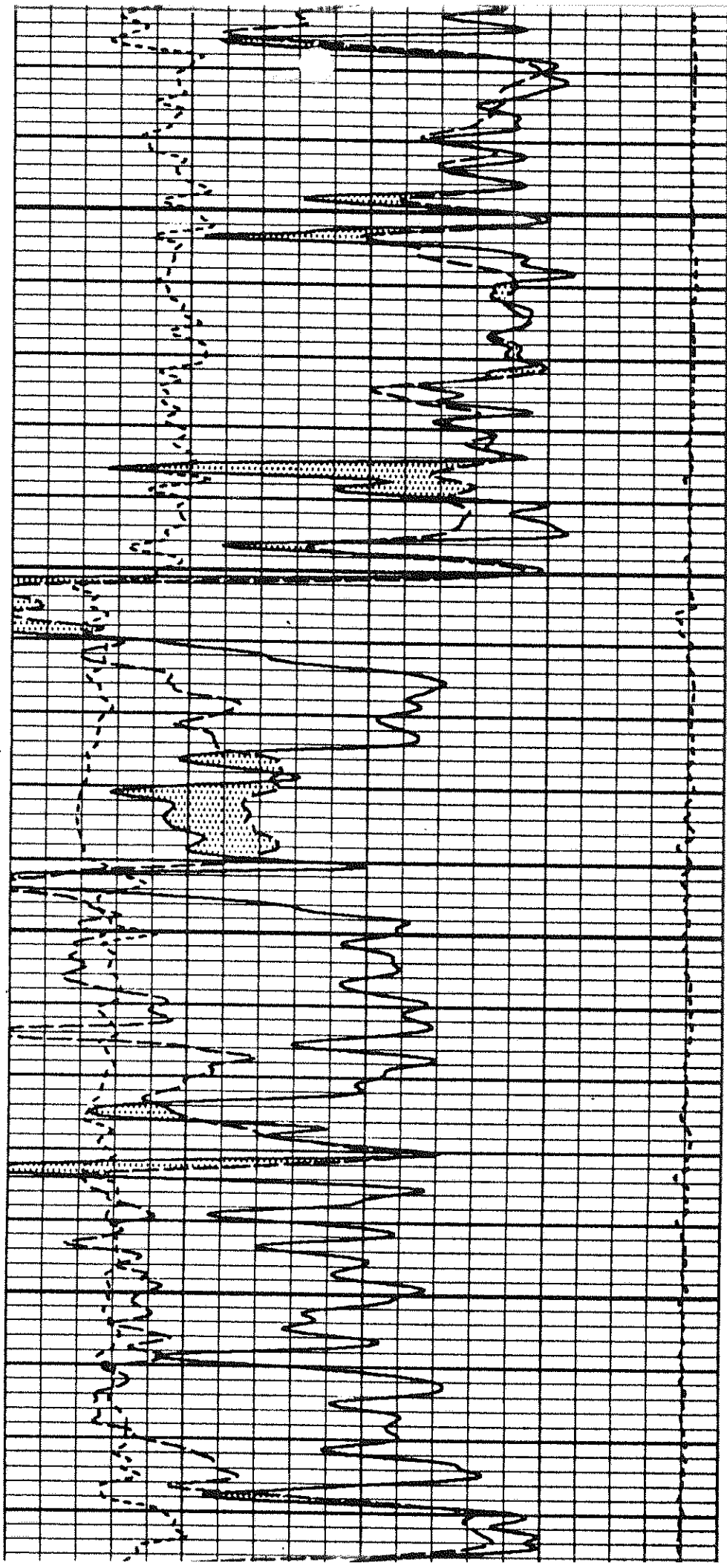
MUD RECORD

MUDDER UP AT 3650' ON 5-17-89

[illegible]

DRILL STEM TEST #1

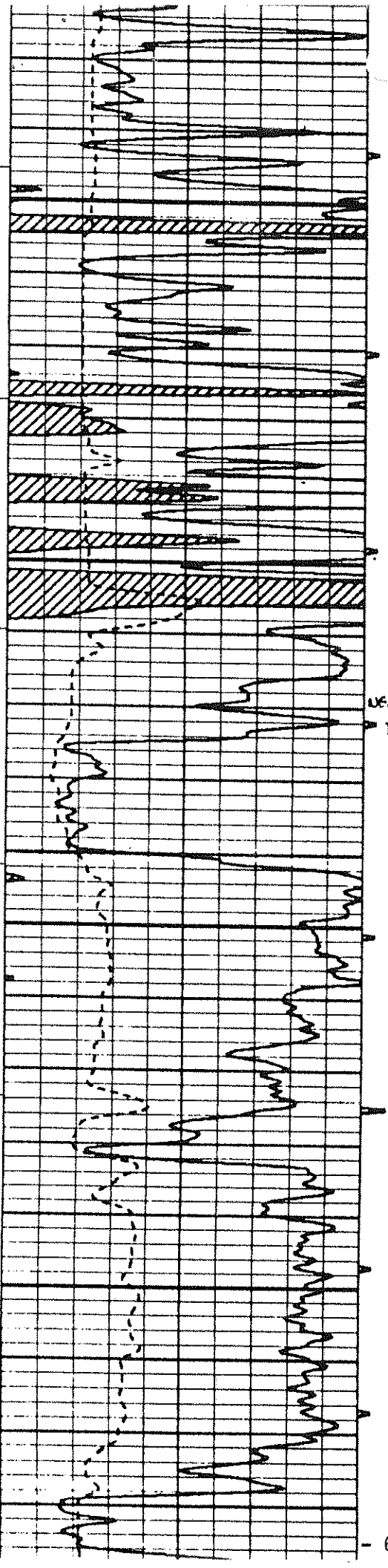
FORMATION:	Morrow Sandstone
INTERVAL:	4944' - 4996'
TYPE TEST:	Conventional open hole dual packer
TESTING COMPANY:	Western Testers, Jim Wondra
IF 15 MINUTES:	Opened toll with strong blow, bottom of bucket in 1 minute and remained throughout open
ISI 30 MINUTES:	Shut in tool with bottom of bucket and remained at bottom of bucket throughout shut in
FF 60 MINUTES:	Opened tool at bottom of bucket and remained throughout open
FSI 120 MINUTES:	Shut in tool at bottom of bucket, decreased and died 1 hour and 15 minutes
RECOVERY:	310' Muddy water 1970' Salt water
PRESSURES:	IH 2489 IF 416 - 558 ISI 1368 FF 670 - 1085 FSI 1368 FH 2469
BOTTOM HOLE TEMPERATURE:	134°F



04300

NEUTRON
COUNT

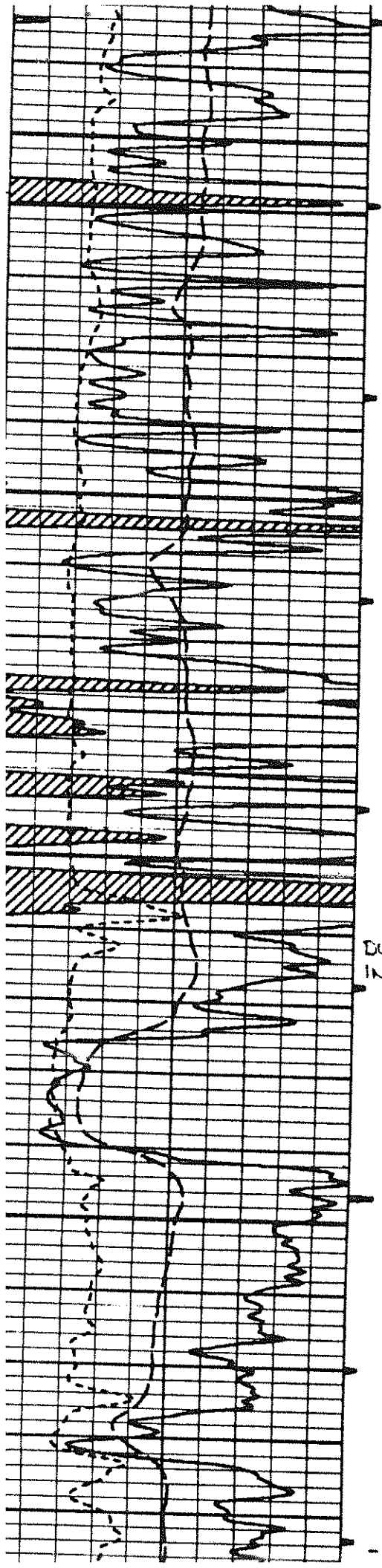
05000



04900

SNIC

05000

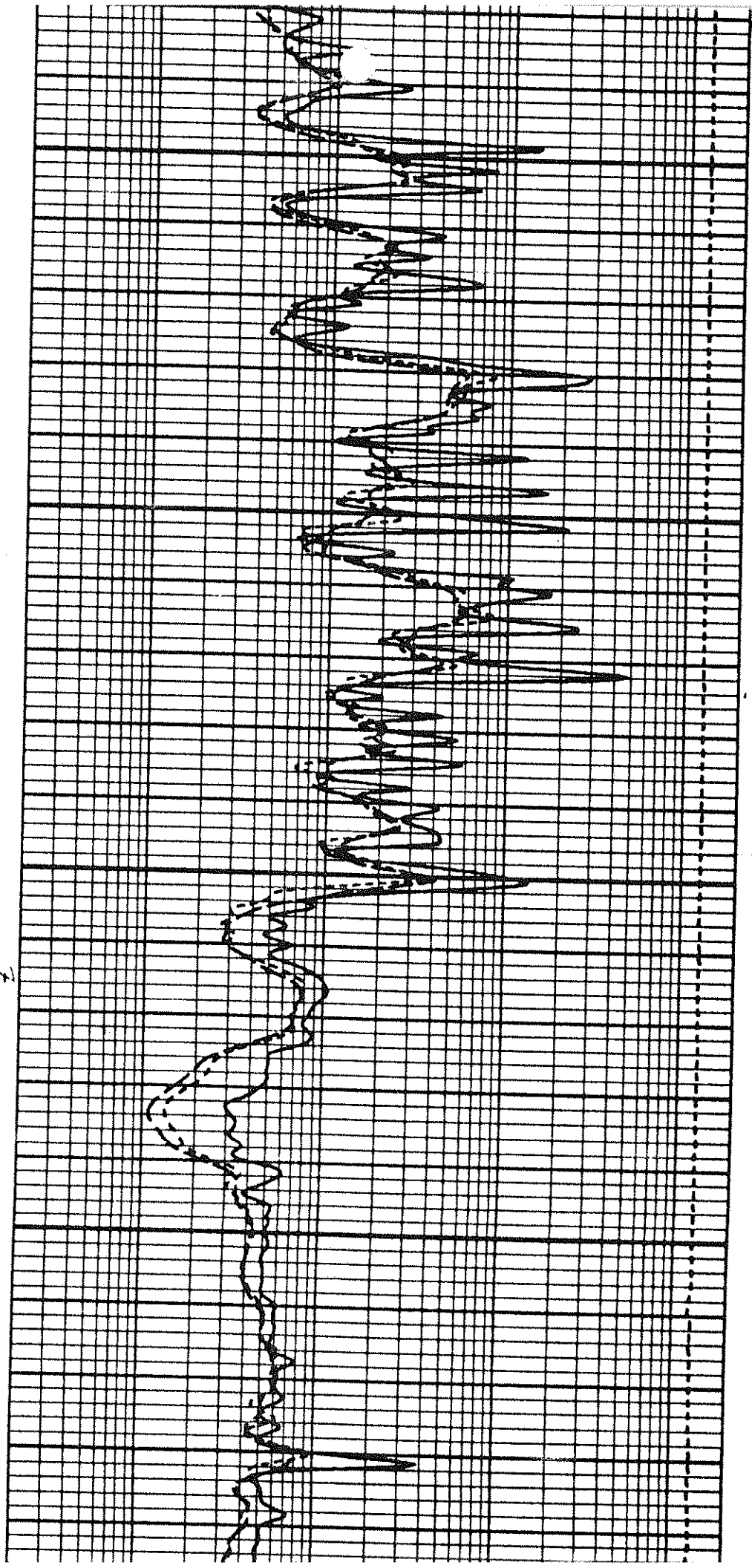


04300

DUAL
INDUCTION

05000

8



LITHOLOGICAL SUMMARY

NOTE: All samples caught by drilling crews. Samples described are not lagged.

- 3500' - 3530' Limestone- (30%) white, cream, brown, firm, crypto to micro crystalline, chalky, anhydritic in part, no visible porosity, yellow mineral fluorescence, no visible cut, occasional anhydrite- white, light brown, pink, granular to crystalline
 Shale- (70%) red/brown, trace: grey/green, soft to firm, irregular to blocky, subplatey to platey, no to trace calcareous, rare silty to sandy
- 3530' - 3540' Limestone- (50%) white, cream, light brown, firm, crypto to finely crystalline, dense, anhydritic in part, no visible porosity, bright yellow mineral fluorescence, no visible cut
 Shale- (50%) red/brown, grey/green, blocky, platey, soft to firm, occasionally calcareous, slightly silty
- 3540' - 3550' Limestone- (90%) cream, white, grey/brown, light brown, firm, cryptocrystalline, occasionally very fine crystalline, trace: anhydrite, trace: fossils, no visible porosity, bright yellow mineral fluorescence, no visible cut
 Shale- (10%) red/brown, grey/green, soft to firm, blocky to irregular, no to trace calcareous, chalky, earthy
- 3550' - 3580' Limestone- (80%) grey/brown to brown, light to medium grey, micro to very finely crystalline, mottled to splotchy in part, firm, oolitic in part, grainy in part, occasional crystalline anhydrite, trace: fossils, occasional light brown to milky chert, no visible to poor oolmoldic porosity, poor intergranular porosity, dull to moderate gold mineral fluorescence, no visible cut
 Shale- (20%) red/brown, grey/green, soft to firm, blocky to irregular, no to trace calcareous, chalky, earthy
- 3580' - 3600' Limestone- (60%) grey/brown, light to medium grey, micro to very finely crystalline, mottled, oolitic in part, occasionally grainy, dense, poor intergranular porosity, mineral fluorescence, no visible cut, occasional anhydrite- clear, white, pink, crystalline
 Shale- (40%) red/brown, grey/green, blocky, subplatey, soft to firm, no to trace calcareous
- 3600' - 3620' Limestone- (70%) light to medium grey, grey/brown, white, crypto to micro crystalline, firm, dense, grainy, occasionally oolitic, argillaceous in part, no visible porosity, bright yellow mineral fluorescence, no cut
 Shale- (30%) red/brown, medium grey, blocky to subplatey, soft to firm, no to trace calcareous, chalky to earthy

- 3620' - 3640' Limestone- (70%) grey/brown, light to medium grey, light to medium brown, white, crypto to microcrystalline, firm, predominately dense, occasional oolites, trace: fossils, occasional anhydrite, some milky to light brown chert, no visible porosity, dull to bright yellow mineral fluorescence, no visible cut
Shale- (30%) red/brown, medium grey to occasional dark grey, blocky to subplatey, no to trace calcareous
- 3640' - 3690' Limestone- (40%) medium grey, grey/brown, light to medium brown, micro to very finely crystalline, firm, microsucrsic in part, occasional fossils, poor pinpoint vugular porosity, moderate to bright yellow mineral fluorescence, rare black dead oil stain, weak slow streaming yellow cut
Shale- (60%) red/brown, medium grey, blocky to platey, firm, no to trace calcareous
- 3690' - 3700' No sample
- 3700' - 3720' Limestone- (40%) medium grey, grey/brown, light to medium brown, micro to finely crystalline, firm, rare oolites and fossils, occasional pyrite, no to poor inter-crystalline porosity, moderate to bright yellow mineral fluorescence, no visible cut
Shale- (60%) red/brown, medium grey, trace: green, blocky to subplatey, soft to firm, no to trace calcareous, silty in part, pyrite in part
- 3720' - 3730' Limestone- (70%) light to medium grey, light to medium brown, crypto to microcrystalline, dense, argillaceous, carbonaceous in part, fossils in part, grainy in part, no visible porosity, dull to bright yellow mineral fluorescence, no visible cut
Shale- medium grey, red/brown, blocky to subplatey, firm, limey in part, rare fossils(30%)
- 3730' - 3750' Limestone- (90%) light to medium grey, occasionally light brown, microcrystalline, firm, fossils in part, argillaceous in part, rare .25mm oolites, no to very poor oolmoldic porosity, dull to moderately yellow mineral fluorescence, no visible cut
Shale- (10%) medium grey, red/brown, blocky to subplatey, firm, limey in part, rare fossils
- 3750' - 3780' Limestone- (90%) light grey, light brown, mottled in part, medium grey, micro to very finely crystalline, firm, fossiliferous in part, very fine oolites in part, slightly argillaceous, slightly chalky, rare pyrite, no visible porosity, dull to bright yellow mineral fluorescence, no visible cut
Shale- (10%) medium grey, dark grey, red/brown, green, blocky to subplatey, firm, limey in part, rare fossils, occasional pyrite

- 3780' - 3790' Limestone- (90%) light to dark grey, light to dark brown, micro to very finely crystalline, mottled in part, firm, fossiliferous in part, occasional oolites, slightly argillaceous, pyrite in part, no visible porosity, dull to bright yellow mineral fluorescence, no visible cut
 Shale- (10%) medium to dark grey, blocky to subplatey, firm, calcareous in part, occasional fossils
- 3790' - 3810' Limestone- (90%) light to medium grey, light brown, micro to very finely crystalline, fossils, very fine oolites in part, argillaceous in part, no to poor oolmoldic and intercrystalline porosity, dull to moderate yellow fluorescence, no visible cut
 Shale- medium to dark grey, grey/brown, red/brown, green, blocky to subplatey, firm, limey in part, trace pyrite, fossils in part
- 3810' - 3820' Limestone- (90%) light to medium grey, grey/brown, micro to finely crystalline, firm, dense, argillaceous in part, oolites in part, trace: poor pinpoint vugular porosity, dull to moderate yellow fluorescence, no visible cut
 Shale- medium to dark grey, grey/brown, red/brown, green, blocky to subplatey, firm, limey in part, trace pyrite, fossils in part (10%)
- 3820' - 3840' Limestone- (70%) light to medium grey, grey/brown, medium brown, micro to very finely crystalline, firm, predominately dense, fossiliferous in part, rare very fine oolites, argillaceous in part, no visible porosity, dull to moderately yellow fluorescence, no visible cut
 Shale- (30%) red/brown, medium grey, trace black, blocky to subplatey, irregular, firm, no to trace calcareous, earthy to gritty
- 3840' - 3860' Limestone- (80%) light to medium grey, light brown, micro to very finely crystalline, firm, dense, grainy, fossils, occasional very fine oolites, no to very poor oolmoldic porosity, dull to moderate yellow mineral fluorescence, no visible cut
 Shale- (20%) red/brown, medium grey, trace black, blocky to subplatey, irregular, firm, no to trace calcareous, earthy to gritty
- 3860' - 3900' Limestone- (70%) light brown, grey/brown, light to medium grey, micro to very finely crystalline, firm, dense, fossiliferous, trace: oolites, argillaceous in part, no to poor oolmoldic and intercrystalline porosity, dull to moderate yellow mineral fluorescence, no visible cut
 Shale- (30%) red/brown, medium to dark grey, trace black, trace green, blocky, firm, very slightly calcareous, rare disseminated pyrite, slightly carbonaceous

- 3900' - 3910' Limestone- (60%) as above, predominately light to medium brown, fossiliferous and very oolitic, chalky in part, no visible to poor oomoldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (40%) mediumgray, red brown, firm, blocky, slightly to moderately calcareous, very calcareous in part, trace pyrite.
- 3910' - 3920' Limestone- (70%) lightgray lightgray, graybrown mediumgray, firm, very fine crystalline, fossiliferous, very fine oolitic, chalky in part, argillaceous in part, occasional carbonaceous inclusions, rare milky Chert, no visible to poor intercrystalline porosity, trace poor to fair moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (30%) red brown green mediumgray, firm, irregular to blocky, slightly calcareous, trace disseminated pyrite.
- 3920' - 3950' Limestone- (60%) light to mediumgray, graybrown brown, firm, micro to crypto crystalline, dense, argillaceous in part, slightly grainy, slightly fossiliferous, chalky in part, no visible porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (40%) red brown, light to medium gray, graygreen, firm, blocky, non to moderately calcareous, silty in part, rare micro pyrite.
- 3950' - 3970' Limestone (80%)- lightbrown lightgray white mediumgray, firm, soft in part, crypto to micro to very fine crystalline, fossiliferous, algal in part, very chalky in part, rare shaley, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (20%) medium to darkgray, red brown, graygreen, firm, blocky to subplaty, moderately to very to non calcareous, rare micro pyrite.
- 3970' - 3980' Limestone- (80%) lightbrown brown cream lightgray, firm, micro to very fine crystalline, dense, fossiliferous to algal, chalky in part, no visible to very poor moldic porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- 3980' - 3990' Limestone- (90%) lightbrown lightgray, trace cream white, micro to very fine crystalline, very fossiliferous, chalky in part, no visible to poor interfossiliferous porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale (10%) medium to darkgray, red brown, trace black green, firm, blocky to subplaty, non to moderately calcareous, rare very limey, rare pyrite, rare carbonaceous.
- 3990' - 4000' Limestone- (80%) lightbrown graybrown, light to mediumgray, brown, firm, micro to very fine crystalline, fossiliferous, chalky in part, becoming argillaceous in part, no visible to trace moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (20%) mediumgray, red brown, firm, blocky to subplaty, non to moderately calcareous, rare pyrite, silty in part.

- 4000' - 4010' Limestone- (90%) lightbrown lightgray graybrown, firm, micro to very fine crystalline, very fine fossiliferous, slightly very fine oolitic, trace pelletoids, slightly chalky in part, no visible to poor moldic and inter-crystalline porosity, trace fair moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (10%) mediumgray, red brown, firm, blocky to subplaty, non to moderately calcareous, rare pyrite, slightly silty in part.
- 4010' - 4040' Limestone- (80%) lightbrown graybrown lightgray, firm, micro to very fine to crypto crystalline, dense, fossiliferous in part, chalky in part, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (20%) light to medium gray, red brown, trace green, firm, blocky, silty in part, non to moderately calcareous.
- 4040' - 4060' Limestone- (90%) light graybrown, lightbrown, firm, micro to crypto to very fine crystalline, dense, fossiliferous in part, chalky in part, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (10%) red brown, medium to darkgray, trace green, firm, blocky, non to moderately calcareous.
- 4060' - 4080' Limestone- (80%) lightbrown tan lightgray, firm, micro to very fine to crypto crystalline, dense, fossiliferous in part, slightly grainy in part, no visible to poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (20%) red brown, mediumgray, trace black green, firm, blocky to subplaty, non to moderately calcareous, rare carbonaceous.
- 4080' - 4100' Limestone- (90%) lightbrown graybrown, firm, micro to very fine crystalline, fossiliferous in part, argillaceous in part, slightly grainy in part, no visible porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (10%) red brown mediumgray, trace black green, firm, blocky to subplaty, non to moderately calcareous, rare carbonaceous.
- 4100' - 4130' Limestone- (80%) graybrown brown, light to medium gray, firm, micro to very fine crystalline, dense, fossiliferous, argillaceous in part, grainy in part, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (20%) mediumgray graygreen, red brown, trace black, firm, blocky, non to moderately calcareous, silty in part, rare carbonaceous, rare pyrite.
- 4130' - 4140' Limestone- (80%) cream offwhite, firm, micro to very fine rare fine crystalline, dense, chalky in part, trace fossiliferous, trace crystalline Anhydrite, no visible porosity, bright to moderate yellow mineral fluorescence, NSOC.
Shale- (20%) graygreen, medium to darkgray, red, firm, blocky, slightly to moderately calcareous, rare carbonaceous inclusions, slightly silty in part.

- 4140' - 4170' Limestone- (90%) offwhite cream, firm, micro to very fine crystalline, dense, grainy in part, occasional translucent white crystalline Anhydrite, chalky in part, fossiliferous in part, no visible trace poor intercrystalline porosity, bright to moderate yellow mineral fluorescence, NSOC.
Shale- (10%) medium to darkgray, graygreen red, firm, blocky, slightly to moderately calcareous, rare carbonaceous inclusions, slightly silty in part.
- 4170' - 4180' Limestone- (80%) as above, becoming argillaceous and shaley in part, no visible porosity, moderate to bright yellow mineral fluorescence, NSOC.
Shale- (20%) medium to darkgray, red brown green, trace black, firm, blocky to subplaty, slightly to non calcareous, silty in part, rare carbonaceous.
- 4180' - 4190' Limestone- (90%) offwhite cream lightbrown, firm, micro to crypto crystalline, dense, grainy in part, slightly fossiliferous, argillaceous in part, no visible porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale (10%) red green, mediumgray, trace black, firm, blocky to irregular, silty in part, slightly calcareous, rare pyrite.
- 4190' - 4210' Limestone- (70%) lightbrown lightgray cream, firm, micro crystalline, dense, grainy, fossiliferous in part, argillaceous in part, no visible to very poor intercrystalline porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (30%) mediumgray green red, firm, blocky to irregular, non to slightly calcareous, silty in part, trace pyrite.
- 4210' - 4220' Limestone- (90%) lightbrown cream white, firm, very fine to micro crystalline, predominately dense, rare pyrite, no visible to poor intercrystalline porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
Shale- (10%) medium to darkgray, green red, firm, non to slightly to moderately calcareous, rare pyrite, rare carbonaceous.
- 4220' - 4230' Limestone- (80%) as above with- brown browngray, firm, micro to very fine crystalline, fossiliferous, argillaceous in part, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
Shale- (20%) medium to darkgray, green red, firm, non to slightly to moderately calcareous, rare pyrite, rare carbonaceous.
- 4230' - 4240' Limestone- (70%) lightbrown lightgray graybrown, firm, micro crystalline, argillaceous in part, chalky in part, fossiliferous in part, grainy in part, no visible to very poor intercrystalline porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
Shale- (30%) red mediumgray, trace black green, firm, blocky to subplaty, non to moderately calcareous, silty in part, rare carbonaceous.

- 4240' - 4250' Limestone- (50%) light to mediumgray, lightbrown graybrown, micro crystalline, dense, predominately argillaceous, slightly fossiliferous in part, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (50%) red mediumgray green, firm, blocky to subplaty, non to moderately calcareous, silty in part, rare carbonaceous.
- 4250' - 4290' Limestone- (70%) tan lightbrown, cream lightgray, firm, micro to very fine crystalline, very fine oolitic (.25-.5 mm) in part, slightly fossiliferous, chalky in part, no visible trace very poor oomoldic porosity, dull yellow mineral fluorescence, NSOC.
 Shale- (30%) red mediumgray, green, firm, blocky to subplaty, non to moderately calcareous, silty in part, rare carbonaceous.
- 4278' - 4288' Circulated up drilling break at 4288'
 Limestone- (80%) tan lightbrown cream, firm to very firm, very fine to micro crystalline, fine crystalline in part, fossiliferous in part, occasional .2-.5 mm oolites, trace pyrite, grainy, poor trace fair moldic porosity, poor intercrystalline porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (20%) red medium to darkgray, green black, firm, blocky to subplaty, non to moderately calcareous, silty in part, rare carbonaceous, rare pyrite.
- 4290' - 4320' Limestone- (80%) lightbrown lightgraybrown, firm, micro to crypto to very fine crystalline, dense, fossiliferous in part, slightly chalky in part, no visible to very poor intercrystalline porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (20%) red, medium to darkgray, green black, firm, blocky trace subplaty, non to moderately calcareous, silty in part, rare pyrite.
- 4320' - 4330' Limestone- (90%) lightbrown cream, firm, micro to crypto to very fine crystalline, dense, fossiliferous in part, occasional crystalline Anhydrite, trace milky Chert, no visible to very poor intercrystalline porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (10%) red, medium to darkgray, green black, firm, blocky, trace subplaty, non to moderately calcareous, silty in part, rare pyrite.
- 4330' - 4340' Limestone- (80%) lightgray cream lightbrown, firm, crypto to micro crystalline, dense, chalky in part, rare fossiliferous, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (20%) red brown, medium to darkgray, green, firm, blocky to subplaty, non to slightly to moderately calcareous, silty in part, rare pyrite.

- 4340' - 4360' Limestone- (80) light grey, cream, light brown, firm, crypto to finely crystalline, dense, chalky in part, rare fossils no visible porosity, occasional dull yellow mineral fluorescence, NSOC
Shale- (20) red/brown, medium to dark grey/brown, green, firm, blocky to subplatey, no to slightly moderately calcareous, silty in part, rare pyrite
- 4360' - 4370' Limestone- (80) light to medium grey, light to medium brown, tan, firm, micro to very finely crystalline, dense, argillaceous in part, chalky in part, trace fossils, trace carbonaceous inclusions, no visible porosity, occasional dull yellow mineral fluorescence, NSOC
Shale- (20) medium to dark grey, red, firm, blocky to subplatey, slight to moderately calcareous, fossiliferous in part, rare disseminated pyrite
- 4370' - 4400' Limestone- (80) light brown, light grey/brown, light grey, firm, micro to very fine to crypto crystalline, dense, argillaceous in part, slightly fossiliferous, chalky in part, grainy in part, no to very poor moldic porosity, occasional dull to moderate yellow mineral fluorescence, NSOC
- 4400' - 4420' Limestone- (80) light brown, light to medium grey, firm, very fine to microcrystalline, slight to moderately fossiliferous, chalky in part, argillaceous in part, no visible porosity, dull to moderate yellow mineral fluorescence, NSOC
Shale- (20) medium to dark grey, red/brown, green, black, firm, blocky to trace subplatey, slight to moderately calcareous, trace fossils, trace carbonaceous
- 4420' - 4450' Limestone- (90) light brown, cream, grey/brown, firm, very fine to micro to crypto crystalline, fossiliferous, algal in part, chalky in part, slightly argillaceous, no to very poor intercrystalline porosity, trace fair moldic porosity, occasional dull to moderate yellow mineral fluorescence, NSOC
Shale- (10) medium to dark grey, red/brown, green, firm, blocky, slight to moderately calcareous, silty in part
- 4450' - 4460' Limestone- (80) light brown, cream, grey/brown, firm, vrey fine to micro to crypto crystalline, fossiliferous, algal in part, chalky in part, slightly argillaceous, trace .5mm oolites, no to very poor intercrystalline porosity, occasional dull to moderately yellow fluorescence, NSOC
Shale- (20) medium to dark grey, black, red/brown, green, firm, blocky, subplatey, slightly calcareous

- 4460' - 4480' Limestone- (90) cream, off white, light brown, light grey/
brown, firm to very firm, crypto to micro crystalline,
trace very finely crystalline, dense, fossiliferous
in part, sub chalky, no visible porosity, moderate
yellow mineral fluorescence, NSOC
Shale- medium to dark grey, black, red/brown, firm, blocky
sub platey, no to slightly calcareous, rare silty
- 4480' - 4500' Limestone- (90) light brown, cream, firm to very firm,
crypto to micro crystalline, trace very finely
crystalline, dense, chalky in part, trace to slightly
fossiliferous, no visible porosity, moderate yellow
mineral fluorescence, NSOC
Shale- (10) medium grey, black, red/brown, green, firm, blocky,
trace subplatey, slight to moderately calcareous,
trace subwaxy
- 4500' - 4520' Limestone- (90) light grey, light brown, grey/brown, firm,
micro to very finely crystalline, dense, becoming
fossiliferous, algal in part, chalky in part,
slightly argillaceous, no visible to very poor moldic
porosity, dull to moderately yellow fluorescence, NSOC
Shale- (10) medium to dark grey, black, firm, blocky to
subplatey, carbonaceous in part
- 4520' - 4540' Limestone- (90) light to medium grey, light brown, grey/brown,
firm to very firm, micro to trace very finely
crystalline, fossiliferous in part, algal in part,
trace pellets, argillaceous in part, chalky in part,
no visible porosity, occasional fair moldic porosity,
occasional dull to moderately yellow mineral fluorescence,
NSOC
Shale- (10) medium to dark grey, black, brown, firm, blocky to
subplatey, slightly calcareous, trace carbonaceous,
subwaxy in part
- 4540' - 4560' Limestone- (90) cream, light brown, light grey, fine to medium
crystalline, firm to moderately hard, very oolitic
in part, fossiliferous, grainy, quartz filled vugs,
no to poor visible porosity, dull to moderate yellow
fluorescence, no cut
Shale- (10) red/brown, dark grey, blocky, fissileous,
soft to firm, slightly calcareous, slightly carbonaceous
- 4560' - 4580' Limestone- (90) cream, light to medium brown, occasionally
dark brown, fine to medium crystalline, firm to moderately
hard, dense in part, chalky in part, grainy in part,
dark inclusions, fossils, occasional oolites, no to
very poor intercrystalline porosity, mineral fluorescence,
NSOC
Shale- (10) red/brown, green, dark brown to black, blocky,
splintery, firm, slightly calcareous

- 4580' - 4600' Limestone- (100) tan, light grey/brown, pink, finely crystalline, firm to moderately hard, grainy, fossiliferous, chalky in part, slightly argillaceous, poor to fair intercrystalline porosity, mineral fluorescence, NSOC
- 4600' - 4620' Limestone- (90) predominately medium brown, light brown, cream, fine to medium crystalline, firm to hard, dense, slightly grainy, fossiliferous in part, no to poor intercrystalline porosity, dull yellow mineral fluorescence, NSOC
Shale- (10) red/brown, dark grey/brown, black, blocky, splintery, firm, carbonaceous
- 4620' - 4650' Limestone- (100) light to medium brown, occasional dark brown, medium grey, pink, crypto to finely crystalline, firm to hard, dense, grainy in part, chalky in part, fossils, poor intercrystalline porosity, dull yellow mineral fluorescence, NSOC
- 4650' - 4680' Limestone- (90) white, light to medium brown, occasional dark brown, crypto to medium crystalline, firm to hard, occasionally dense, chalky in part, very oolitic, pellets, fossiliferous, grainy, poor oolmoldic and intercrystalline porosity, bright yellow mineral fluorescence, NSOC
Shale- (10) red/brown, black, blocky, splintery, firm, slightly calcareous, silty in part, occasional anhydrite- pink crystalline, firm
- 4680' - 4710' Limestone- (70) white, light to medium brown, occasional dark brown, crypto to medium crystalline, firm to hard, occasionally dense, chalky in part, very oolitic, pellets, fossiliferous, grainy, poor oolmoldic and intercrystalline porosity, bright yellow mineral fluorescence, NSOC
Shale- (30) medium to dark brown, red/brown, black, blocky, splintery, firm, silty in part
- 4710' - 4750' Limestone-(60) cream, light to medium brown, dark brown, crypto to finely crystalline, occasionally medium crystalline, firm to moderately hard, dense, chalky in part, very oolitic in part, pellets, fossils, grainy, slightly argillaceous, occasional dead oil stain, poor to fair visible porosity, poor oolmoldic porosity, dull to bright yellow mineral fluorescence, NSOC
Shale- (40) black, red/brown, dark brown, green, blocky, splintery, firm, slightly calcareous, carbonaceous
- 4750' - 4780' Limestone- (80) light grey, light to medium brown, crypto to finely crystalline, firm to moderately hard, oolites, fossils, slightly argillaceous, grainy, poor to fair intercrystalline porosity, poor oolmoldic porosity, dull to bright yellow mineral fluorescence, NSOC
Shale- (20) medium to dark grey, black, medium brown, red/brown, green, blocky, splintery, firm, carbonaceous, slightly calcareous, silty in part

- 4780' - 4800' Limestone- (80%) lightbrown brown, firm to very firm, micro to very fine crystalline, dense, fossiliferous, oolitic in part, grainy in part, white soft chalky in part, argillaceous with shaley partings in part, no visible to very poor intercrystalline and moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale (20%) medium to darkgray, black brown, red, firm, blocky, carbonaceous in part, slightly calcareous, silty in part, trace disseminated and nodular pyrite.
- 4800' - 4810' Limestone- (70%) lightbrown brown, firm to very firm, micro to fine crystalline, dense, fossiliferous, oolitic in part, grainy in part, white soft chalky in part, argillaceous with shaley partings in part, no visible to very poor intercrystalline and moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (30%) medium to darkgray, black brown, firm, blocky to splintery, slightly to moderately calcareous, trace limey, carbonaceous, trace pyrite.
- 4810' - 4830' Limestone- (90%) light to medium brown, graybrown lightgray, firm to very firm, micro crystalline, dense, slightly to moderately fossiliferous, argillaceous in part, grainy in part, no visible porosity, dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (10%) darkgray, firm to very firm, blocky, moderately calcareous, trace disseminated pyrite, slightly carbonaceous.
- 4830' - 4850' Limestone (70%) light to medium graybrown, brown, firm to very firm, micro to crypto crystalline, dense, fossilifeous, argillaceous in part, slightly silty, slightly grainy, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (30%) darkgray, firm to very firm, blocky, moderately calcareous, trace pyrite.
- 4850' - 4880' Limestone- (60%) light to medium graybrown, light to medium brown, firm, micro to crypto crystalline, dense, fossiliferous, argillaceous, chalky in part, silty in part, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.
 Shale- (40%) darkgray black brown, firm, blocky, splintery in part, moderately calcareous, trace pyrite, slightly carbonaceous.
- 4880' -4900' Limestone- (60%) light to medium gray, light to medium brown, graybrown, firm trace hard, micro crystalline, dense, argillaceous, fossiliferous, silty to sandy, trace pyrite, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
 Shale- (40%) medium to darkgray, brown green black, firm, blocky to subplaty, trace splintery, slightly to moderately calcareous, subwaxy in part, trace pyrite.
- 4900' - 4920' Limestone- (70%) light to medium gray, graybrown brown, firm, micro to crypto trace very fine crystalline, dense, argillaceous, fossiliferous in part, chalky in part, trace carbonaceous partings, no visible porosity, dull yellow mineral fluorescence, NSOC.

- Shale- (30%) medium to darkgray, black, trace brown green buff, firm, blocky to subplaty, slightly to moderately calcareous, trace pyrite, trace subwaxy
- 4920' - 4930' Limestone- (70%) cream medium to darkbrown, graybrown bluegray, firm to hard, micro to fine crystalline, mottled, argillaceous, dense, fossiliferous, chalky in part, no visible to poor intercrystalline porosity, occasional black dead oil stain, occasional yellow mineral fluorescence, NOC.
- Shale- (30%) darkgray black, firm, blocky to splintery, calcareous.
- 4930' - 4950' Limestone- (60%) cream, light to medium brown, light to medium gray, soft to hard, crypto to fine crystalline, dense, grainy, argillaceous, slightly fossiliferous, no visible to poor intercrystalline porosity, dull yellow mineral fluorescence, NSOC.
- Shale- (40%) black gray red brown, firm, blocky to subplaty, calcareous.
- 4950' - 4980' Limestone- (50%) medium to lightgray, graybrown, light to medium brown, firm soft in part, crypto to micro crystalline, trace very fine crystalline, argillaceous, fossiliferous, shaley in part, grainy in part, silty in part, trace sandy, trace brown Chert, no visible porosity, dull yellow mineral fluorescence, NSOC.
- Shale- (50%) medium to darkgray, black brown green red, firm, blocky to subplaty, trace platy, moderately to slightly calcareous, carbonaceous in part, trace pyrite.
- 4980' - 4990' Limestone- (50%) lightgray graybrown lightbrown brown, firm to very firm, micro to crypto crystalline, trace very fine crystalline, dense, fossiliferous in part, argillaceous in part, grainy in part, silty to sandy in part with trace silt and sand stringers, slightly chalky, trace brown Chert, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- Shale- (50%) medium to darkgray, black brown green, red, firm, blocky to subplaty to platy, slightly to moderately calcareous, trace limey, carbonaceous in part, occasionally subwaxy, trace pyrite.
- 4986'- Circulation samples.
- Limestone- (60%) graybrown, light to mediumbrown, firm, crypto to micro crystalline, trace very fine crystalline, dense, fossiliferous, grainy in part, argillaceous, occasionally silty to sandy, no visible to very poor moldic porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- Shale- (30%) medium to darkgray, black brown green, firm to very firm, blocky to platy, slightly to moderately calcareous, carbonaceous in part, subwaxy in part, trace pyrite.
- Sandstone- (10%) translucent lightgray, trace mediumgray salt& pepper, irriable to very firm with occasional loose grains, very fine to fine trace medium grained, subangular to sub-round, moderate trace well sorted, well cemented with silica, white clay filled in part, trace pyrite, rare glauconite and k-spar, no visible to poor rare fair intergranular porosity, trace spotty yellow mineral fluorescence, NSOC.

4996' -

Circulation Samples

Limestone- (40%) graybrown, light to medium brown, firm, crypto to micro crystalline, trace very fine crystalline, dense, fossiliferous, argillaceous, grainy in part, occasionally silty to sandy, no visible to very poor moldic porosity, dull to moderate yellow mineral fluorescence, NSOC.

Shale (20%) darkgray black, mediumgray red green brown, firm, blocky to subplaty to platy, slightly to non calcareous, silty in part, carbonaceous in part, fossiliferous in part, trace pyrite.

Sandstone- (40%) lightgray translucent white, friable to hard, abundant loose grains, fine to medium grained, occasional coarse grains, occasional very fine to fine grained, subangular to subround, poor to moderate sorting, well cemented with silica, secondary quartz overgrowth, clean to white clay filled, trace lightgray silty clay filled, trace carbonaceous inclusions, rare glauconite, rare Chert, rare shell fragments, no visible to fair (10-12%) porosity, trace spotty yellow mineral fluorescence, NSOC with rare very weak slow cloudy yellow cut.

5000' - 5030'

Limestone- (10%) light to medium brown, light to medium gray, firm, micro to crypto crystalline, fossiliferous, argillaceous, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.

Shale- (80%) medium to darkgray black, brown lightgray green, firm, subplaty to platy to blocky, non to trace calcareous, silty in part, carbonaceous in part, occasional pyrite.

Sandstone (10%) lightgray translucent, hard to loose, fine to coarse grained, subround to subangular, poor trace moderate sorting, well cemented with silica, secondary quartz overgrowth, trace pyrite k-spar and glauconite, no visible to very poor intergranular porosity, NSOFC.

5038' -

Circulation Samples

Shale- (80%) medium to darkgray, black brown lightgray green, firm, subplaty to platy to blocky, non to trace calcareous, silty in part, carbonaceous in part, occasional pyrite.

Limestone (5%)-as above.

Sandstone- (15%) white lightgray, very firm, fine occasional coarse grained, subangular to subround, poor sorting, well cemented with silica, some clay fillinf, glauconitic in part, mafic in part, argillaceous in part, poor intergranular porosity, occasional dull yellow mineral fluorescence, NSOC.

5030' - 5040'

Shale- (60%) as above.

Sandstone- (30%) white lightgray, trace mediumgray salt&pepper, friable to very firm, predominately very fine to fine grained, trace fine to medium grained, subangular to subround, moderate to well sorting, trace poor sorting, well cemented with silica, slightly glauconitic, occasional carbonaceous inclusions, becoming clay filled and argillaceous in part, trace intergranular pyrite, no visible to poor intergranular porosity, trace yellow mineral fluorescence, NSOC.

Silt- (10%) light to mediumgray salt&pepper, firm to friable, siliceous, sandy in part, trace carbonaceous inclusions, trace disseminated pyrite.

- 5040' - 5070' Shale (80%) medium to darkgray, black, brown, firm to very firm, subplaty to platy, trace splintery, carbonaceous in part, micro micaceous, silty in part with occasional silt and sand stringers, trace pyrite.
 Sandstone- (15%) white lightgray, trace mediumgray salt&pepper, friable to very firm, very fine to fine grained, subangular to subround, moderate to well sorted, calcite-silica cement, clay filled, trace carbonaceous inclusions, trace glauconite, tight, no visible to very poor intergranular porosity, NSOFC.
- 5068' - Circulation Samples
 Shale- (90%) medium to darkgray, brown green lightbrown black, firm, blocky to subplaty to platy, trace to slightly to moderately calcareous, silty in part, carbonaceous in part, trace pyrite.
 Sandstone- (10%) white, light to medium gray, salt&pepper, friable to hard, very fine to fine grained, subround to subangular, moderate to well sorted, silica-calcite cement, clay filled in part, occasional carbonaceous inclusions, trace glauconite, trace pyrite, tight, no visible porosity, NSOFC.
- 5070' - 5090' Shale- (90%) darkgray black, mediumgray green brown, firm, subplaty to platy to splintery, slightly to moderately calcareous, carbonaceous in part, silty in part, trace to occasional pyrite.
 Sandstone- (10%) lightgray white salt&pepper, friable to very firm, trace loose fine to medium grains, very fine to fine grained, subangular to subround, moderate sorting, calcite-silica cement, trace carbonaceous inclusions, trace pyrite, rare glauconite, tight, predominately thin bedded, no visible porosity, NSOFC.
 Limestone (trace) brown, very firm, crystalline, trace floating coarse sand grains, trace pyrite, no visible porosity, NSOFC.
- 5090' - 5110' Shale (80%)-as above.
 Sandstone (10%) as above, becoming dirty in part.
 Limestone (10%)-as above, sandy to conglomeratic in part.
- 5110' - 5120' Shale (70%) medium to darkgray, black, graybrown, firm, blocky to subplaty to platy, non to slightly calcareous, silty to sandy in part, carbonaceous in part, trace pyrite.
 Sandstone- (30%) light to mediumbrown, graybrown gray, very firm, very fine to medium grained, angular to subround, poor sorting, calcite cement, dirty, quartz and Limestone grains with fossil fragments, glauconite, clay filled, mafic in part, tight, no visible porosity, spotty yellow mineral fluorescence, NSOC.
- 5120' - 5130' Shale- (70%) medium to darkgray, brown lightgray, firm, subplaty to blocky to platy, slightly calcareous, micro micaceous, silty in part, carbonaceous in part, rare pyrite.
 Sandstone- (10%) offwhite light to mediumgray, brown salt&pepper, friable to very firm, very fine to fine to medium grained, subangular to subround, poor sorting, calcite-silica cement, dirty, clay filled. trace glauconite, trace pyrite, no visible porosity, occasional yellow mineral fluorescence, NSOC.

- Limestone- (20%) brown graybrown cream, firm to hard, crystalline to micro crystalline, dense, fossiliferous, sandy in part, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.
- 5130' - 5140' Shale- (30%) medium to darkgray black, green brown, firm, subplaty to platy to splintery, slightly calcareous, carbonaceous in part, trace pyrite.
Limestone- (70%) cream lightbrown mediumbrown graybrown, firm, micro crystalline, trace crystalline, dense, sandy, slightly fossiliferous, trace brown Chert, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.
- 5140' - 5160' Shale- (10%) medium to darkgray, black green brown, firm, subplaty to platy to splintery, slightly calcareous, carbonaceous in part, trace pyrite.
Limestone- (90%) cream lightbrown, mediumbrown, firm, micro to crypto crystalline, dense sandy in part, fossiliferous in part, trace brown Chert, rare oolitic, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- 5160' - 5180' Shale- (20%) medium to darkgray, black brown, firm, blocky to subplaty to splintery, non to trace calcareous, trace pyrite, slightly carbonaceous in part.
Limestone- (80%) cream, light to medium brown, graybrown, firm to very firm, micro to crypto to fine crystalline, dense, sandy, fossiliferous in part, occasionally oolitic, trace brown Chert, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- 5180' - 5190' Shale- (20%) medium to darkgray, black, brown, firm, blocky to subplaty to splintery, non to trace calcareous, trace pyrite, slightly carbonaceous in part.
Limestone- (80%) light to mediumbrown cream, firm to very firm, micro to crypto to very fine crystalline, fossiliferous in part, sandy in part, oolitic in part, chalky in part, trace pyrite, trace Chert, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.
- 5190' - 5200' Shale- (20%) medium to darkgray, brown, firm, blocky to subplaty to splintery, trace to slightly calcareous, trace pyrite.
Limestone- (80%) brown, occasionally lightbrown cream, very firm to firm, micro to crypto crystalline, dense, silty to sandy in part, oolitic in part, trace fossiliferous, trace brown Chert, no visible porosity, occasional dull yellow mineral fluorescence, NSOC.
- 5200' - 5230' Shale (20%) darkgray brown mediumgray, firm, blocky to subplaty, trace splintery, slightly calcareous, silty in part, rare pyrite.
Limestone- (80%) mediumbrown cream offwhite, firm to very firm, micro to crypto trace very fine crystalline, dense, sandy in part, rare oolitic, trace pyrite, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- 5230' - 5270' Shale- (10%) medium to darkgray, firm, subplaty, slightly calcareous, trace pyrite, trace carbonaceous.

- Limestone- (90%) lightbrown graybrown; firm to very firm, micro crystalline, dense, sandy in part, trace fossiliferous, slightly chalky in part, trace lightgray brown Chert, no visible porosity, occasional dull to moderate yellow mineral fluorescence, NSOC.
- 5270' - 5300' Shale (10%) medium to darkgray, black green, firm, subplaty to platy, trace to slightly calcareous, trace pyrite, slightly carbonaceous.
- Limestone- (90%) mottled gray graybrown black, brown lightgray, firm to very firm, very oolitic in part, occasional pelletoids, chalky, argillaceous, trace fossiliferous, no visible porosity, splotchy dull yellow mineral fluorescence, NSOC.
- 5300' Circulation Samples
- Shale- (30%) medium to darkgray, graygreen brown black, firm, subplaty to platy to splintery, trace to slightly calcareous, micro micaceous in part, slightly carbonaceous in part, rare pyrite.
- Limestone- (70%) mottled light to mediumgray graybrown light to medium brown, firm to very firm, micro to very fine crystalline, argillaceous, chalky, oolitic, slightly fossiliferous in part, trace brown lightgray Chert, no visible porosity, trace to occasional dull yellow mineral fluorescence, NSOC.