

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # 8

PAGE 1 OF 1

SITE Presho Mole

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED 9-8-17 90° & swing

RUN RQD

LOGGED BY

Depth	Interval		Lith	Recovery RQD	Description
	From	To			
0					solid stem auger
			cuttings		lt brn - brn silty clay (Loess?)
					calcareous
				35'	Captured P-1 sample - This is from Return line -
					Calcareous brown silty mud.
52 ft					weathered brown clay - Probably weathered Pierre shale
					P-2 taken at 53 ft
53					light brown greasy cuttings - appear to be in shale.
54					
					Augr to 67'
99-14 70° 7-storms					set PVC casing to 67'

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CORE LOG DATA SHEET

CORE RUN # 2
PAGE 2 OF 2

SITE Prosho Hole
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED 9-10-14 50° windy
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
67				0.7	lt olive gray & olive gray wx shale some oxidate sl conc 1 1/2" bent @ tip  banded weathering lighter color in weathered zone
69	69			3 1/4	lt olive gray - olive gray claystone still conc P2-SS-C2 As above but some are seen a bit fissile shl wx
74	73			6	tr. sh. to shells P3-SS-C3 Med gray - med dk gray N3 N4 alt conc to shells claystone P4-SS-C4 Med gray - med dk gray claystone some fiss zone tr. shells 1 1/2" bent @ 3' 8" 2" bent @ 5' 5" 4" bent @ 7' 6"
84	83.25			8	86-87 feet drill water turning lighter color
89	87			6.5	med dk gray claystone & shale (fissile) tr. shells

①
②
③
④
⑤
⑥

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CORE LOG DATA SHEET

CORE RUN # _____
PAGE 3 OF _____

SITE _____
CORE BARREL LENGH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED 9-10-14
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
99					claystone & shale to about 3'
(7) 99	-91.25			7'5"	more massive claystone below w/ numerous shell frags
99	-94				still some fossil partings
(8) 99	-97		7'4"		claystone & shale 1/2" bent @ 10" lower irregular to shell frags
99	-101.5			7'8"	claystone some fossil partings 2' bent @ 10" irregular
(9) 99	-104				shell frags 2'2"
104	-106.5			7'5"	claystone & shale more shaly @ top 1/2" bent @ 3" 1"
(10) 104	-111				to shells broken concave 1" @ 6'10"
109	-112.5			8'4"	claystone to shaly 1/2" bent @ 9"
(11) 109	-114				some fossil partings 1/2" bent @ 14"
114	-117			7'11"	claystone 6" bent @ 18"
(12) 114	-119				some fossil partings 1/2" within bent 1" dark concave? fizz hard

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CORE LOG DATA SHEET

CORE RUN # _____

PAGE OF

SITE Fresho

CORE BARREL LENGH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

9-15-2014

[illegible]

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

9-16-2014

SITE _____
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
14	123	124	CLAY shale	1ft (Recovered 8 inches)	bentonite non calcareous PSS-14 (~123.5ft) well indurated dark gray to gray black, Rusty streaks (oxidation?) small shell fragments N3
15	124	129	CLAY shale	9'7" (Recovered 3' from last run)	- Varying degrees of induration, but overall well indurated (clumps of crumbs starting @ 126ft) - small shell fragments N3 - dark gray to grayish black - massive, few bentonite streaks PSS-15
16	129	134	shale	6'2"	- massive - well indurated - shell fragment - bentonite streaks N3
17	134	139	shale	5'	Well indurated @ 134' (~137'9") inoceramus fragment? and @ 134' N3 color massive
18	139	144	shale	7'3 1/2" (cored 5')	Massive N3 color overall shell fragments 2" bentonite @ 142' - color (N7-N8) 2" BENTONITE @ 140' N7-N8 5ft hole - 7ft core CALCAREOUS NEAR BASE Not above P-Pw 2 out of 18 at 142ft
19	144	149	shale	5'2"	Massive (N3) overall shell fragments - 5/16 3/4 - 4/4 shell bed @ 144' bentonite streaks (N7-N8) calcareous shales near 149'
20	149	154	shale	7'8" (Recovered 7'8")	Med. Gray (N5) overall Many shell fragments (specks) throughout (white) bentonite bed @ 154' (pyrite?) Bronze hard to discern from core cake
21	154	157	shale	2'6" recovered	MED GRAY SHALE (N4-N5), UNIFORM, NON CALCAREOUS upper 6" is no good. massive POSSIBLE SILICIFIED BENTONITE well indurated

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9-17-2014

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
(22)			Shale	2' 4"	Short core from yesterday. N5 color N5 medium gray, well indurated; non-calcareous no shells; should be good for geomechanical testing.
159			Shale	5' 7"	Color N4, medium dark gray well indurated non-calcareous no shells pyrite flecks
(23)				35"	N4 Color 1315.25 massive gray shale, well intact; well indurated; may have lost core out bottom of core barrel; excellent core quality; 15" bentonite at 168.5'; no shells no calcareous. Ammonite on the split at 168-32". Took two pictures. No PSS-24 because core too good.
164					
(24)					
169					
(25)					
174					
174'				80"	N4 color, medium dark gray well indurated well intact slightly calcareous bedding plane partings bentonite at 171.5' 1/2" thick 168.5' 1/2" thick P-PW-3 172'

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CORE RUN # _____
PAGE ____ OF ____

9-23-2014

SITE Presko
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Recovered

Depth	Interval		Lith	RQD	Description
	From	To			
Core 26				45" (3.75')	Very well indurated gray shale; matrix color is N4; abundant shell material - Some with clear outline of J; color of shell is moderate orange pink 5YR 8/4
179'					
Core 21				77" (6.4')	Very good core but longer than the drilled interval so probably picked up some core from previous short run. Excellent core quality shows no evidence of plastic elongation. shale matrix color N3; shell material towards top of core; No calcareous matrix; irregular bentonite at 180.5'; 1" thick grey (silty?) bentonite at 183.5'; shell at 182.1 and 182.5'
184'					
Core 28				47" (3.9')	Gray shale with non-calcareous matrix; well indurated - very hard; matrix color is N4; Brownie, non-calcareous, round, tubular feature at 185.4'; 3" thick bentonite at 187' (5Y 8/1); 1/2" thick silty (?) layer at 188.3' (color is N8); small amount of disseminated small pyrite (probably) in top two feet of core. Core cracking obvious but some cracks bleed water.
189'					

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CORE LOG DATA SHEET

CORE RUN # 29
PAGE OF

9-24-2014

SITE Presho
CORE BARREL LENGTH
CORE BARREL DIAMETER
Bit level TOP CORE INTERVAL bit @ 189 feet (ft) (?)
BOTTOM CORE INTERVAL 194 ft.
LENGTH CORED INTERVAL 69.5 inches

RECOVERY
TIME RECOVERED 1130
DATE RECOVERED
RUN RQD
LOGGED BY J.F. Sawyer

Depth	Interval		Lith	RQD	Description
	From	To			
189 ft				↑ 69.5 inches	Grayish black (N2) shale, non calcareous, no bentonite, no concretions, finely laminated, well indurated, "disking" every 4-10 inches, Excellent returns, no obvious macrofossils , pelecypod at top of core
190					
191					
192					Pretty uniform color, lithology, composition for this whole sample. Recovered 69.5 inches (9.5 inches from previous sample?). Appears to be pretty good recovery.
193					[core from <u>≈ 188-194</u>] (*) Bit @ 189-194
194'				↓	* sample from shoe (≈ 1" thick) # PSS 29
					69.5 - 17.0 52.5 52.5 inches in one PVC tube 17.0 inches went into the next tube with core #30.

recovered 69" 1/2" = 5' 9 1/2" (9.5" from previous sample?)

CORE RUN # 30
PAGE OF

RECOVERY _____
TIME RECOVERED 12:15 - 12:30
DATE RECOVERED 9-24-14
RUN RQD _____
LOGGED BY J.F. Sawyer

Bt interval 194-199' feet

{ Recovered
53 inches of core = 4 ft 5 inches

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CORE LOG DATA SHEET

CORE RUN # _____
PAGE **OF** _____

SITE _____
CORE BARREL LENGH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

9-24-2014

Depth	Interval		Lith	RQD	Description
	From	To			
199				11"	massive grey shale; noncalcareous; no shell; no bentonite; slightly fissile towards bottom
(31)					
201					Note: Driller says bit ended at 200 feet rather than 201 ft, even though 2 feet of core was in the bit core barrel.
					Note depths on samples (revised)
					199-200

PAGE OF

LOGGED BY J.F. Sawyer

Core
32

200'-204' bit interval 50.5 inches
~~50~~ inches of core (4 ft 2 in)

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CORE LOG DATA SHEET

CORE RUN # _____
PAGE _____ OF _____

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL 209
LENGTH CORED INTERVAL _____

9-24-2014
1 hr 28 min
required for
drilling
RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____
Entered
1700 hrs.

Depth	Interval		Lith	RQD	Description
	From	To			
0					gray shale top 2" are silty gray (585/1)
1					Greyish black 1/2" for matrix; very well
2					indurated;
3					1/4" bentonite (104R 6/2) at 59-32"
4					thick bentonite (38 to 43) at 59" 104R 6/2, the
5					bentonite has a very thin (~1/8")
6					calcareous layer.
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100					

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CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

9-29-2014

SITE _____
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

214

Depth	Interval		Lith	RQD	Description
	From	To			
214	209'	214'		58.5"	COLOR: N3 THICKLY BEDDED SHALE MASSIVE UNIFORM FOSSILIFEROUS (SHELL FRAGMENTS ON BREAK ENDS) NONCALCAREOUS MATRIX
214	214'	219'		62.5"	COLOR: N2-N3 MASSIVE, NON-FISSILE SHALE MASSIVE : 1/2" BENTONITE BED @ 217' NONFOSSILIFEROUS NONCALCAREOUS MATRIX
219	219'	224'		58"	(Bedding ~ 5" thick) Gray shale N3, massive, non-fissile, noncalcareous matrix; nonfossiliferous; Bentonite (2" thick) with vertical filled (5-16/11) structures but some appear to be open at 221.5' May be worm burrow in PSS-36 (Shore sample).
224					

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PAGE ____ OF ____

9-30-2014

SITE _____
CORE BARREL LENGH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Recovery

Depth	Interval		Lith	RQD	Description
	From	To			
229'					
(37)				4' 11"	N3 matrix; 5 y 6/1 for bentonite Grey black shale; bentonite (1.5") at 227'; non calcareous matrix; non- fossiliferous. Discontinuous bentonite bleb at 228.5'; Bentonite at 227' Shows some vertical fracture fracture
233'				62"	Grey shale, ^{N3} non fossiliferous. non-calceous; 1/4" thick bentonite at 233.5' 5 y 6/1 micaceous toward bottom of core. TOOK PLW-5 at 233' (7 inches).
234'					
(39)				5'	Gray shale; non-fossiliferous; noncalcareous; no discernable bedding; massive; very well indurated. Matrix color N3-N4
239'					
40				43	Grey shale - very well indurated N3 color of matrix; non-fossiliferous. Bentonite bed (not continuous) Q.A. at 239' Bentonite color 5 y R 6/4
44					

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PAGE ____ OF ____

9-30-2014

SITE _____
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

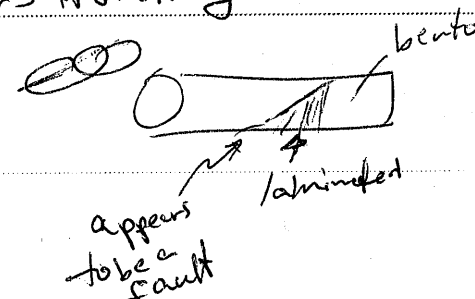
RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
248' - (41)		45		55"	Grey shale ^{1.3} , non-calcareous; very well indurated; irregular bentonite (O/A O) bentonite; angular relationship often in wedges. 5 y 2/1, at 248.5'; small 1/2" bentonite at 247'
249' - (42)				67"	Grey shale; well indurated; picked up at ~ 2 ft from previous run; bentonite (1/2") at 251'. Massive no obvious better with exception of bentonite; Bentonite is lenticular and does not extend through the core.
254' - (43)				34"	matrix non-calcareous; non-fossiliferous. Took PW-6 @ 254-60" (i.e. 249' because from previous run. massive gray shale; moderately indurated (indent slightly with fingernail); non-fossiliferous; no bentonite; matrix w/ higher clay content; very finely laminated (although subtle laminations).

9-~~10~~-2014

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
(44)					gray shale; short cone (but recovered material from last shot run - 1" thick bentonite at 73.5' 26.5' matrix N3; Bentonite color N5; but indurated moderately indurated; 50:44 for 3 ft of drilling  The sketch shows a rectangular core sample. On the left, there are two small circles representing drill holes. An arrow points to a diagonal line across the core with the text 'appears to be a fault'. Another arrow points to a shaded area at the bottom right with the text 'laminated'. The top right corner is labeled 'bentonite'.
62					

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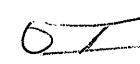
CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

10-1-2014

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
(45)				2'	Recovered for and drilled 2' from where stopped previous day. Matrix US, shell material at 263.5' and 262.5' - probably inoceramus.
264' -1					
(46)				52"	Grey shale; shell material at 265 265' (inoceramus); 265.5' shell material (inoceramus) 267' small shell layer; non calcareous matrix
269'					
(47)				70"	265 272.5 inoceramus 271.5 shear fracture  massive above fracture; Grey shale; slightly calcareous
274					
(48)				52"	Grey shale 278' fault - very good offset Small grains everywhere this flesh occur throughout the core; they do not react to HCl - too small to identify 275.5 Bentonite; many small faults  @ 277' fault zone
279					

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CORE LOG DATA SHEET

CORE RUN # _____

PAGE OF__

SITE Fresho

CORE BARREL LENGH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

10-1-2014

Depth	Interval		Lith	RQD	Description
	From	To			
49					Grey Black shale color N3 (maybe N2) Finely laminated; Grey band at 283'; Deformed Grey band at 282.5 that has fracture running through it. Porewater sample PW-7 taken at 283-284.
284'					
(50)					
289'					Grey Shale with bentonite at 288.9' Finely laminated; laminations and bentonite dipping ~ 8°. Went back and recovered 29" core 14 + 28 = 43" recovery. The upper part was labeled as 289 but the bottom section is "Corrected 289, Bentonite (1") at 288'

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CORE RUN # _____
PAGE ____ OF ____

10-2-2014

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
(51)	PW-8 from top 5 inches (separate piece from previous run)				Grey shale, Bentonite @ 290.5' 10GR 7/4 and 1/2" thick; This bentonite has an underlying whiter layer directly above that is 1/2" thick which has a slightly calcareous composition. At 291.75' a grey (bentonitic?) layer occurs that shows some layering in upper part. This layer is ~1" thick. Remainder of shale is finely laminated and well indurated.
294	Took PSS-51 from upper broken @ 288'				Grey shale N30 color (could also be greenish black)
(52)				56"	Bentonite (1/2" thick) at 295.5'; finely laminated shale with very dip
299'					Bentonite Pale yellowish brown at 293.75'; the bentonite at 295.5' is yellowish grey; non fossiliferous

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10-6-2014

SITE _____

CORE BARREL LENGTH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
53					Grey shale with silty (bentonite?) thin (~2mm) layers at top of core. many partings showing dip (parallel to bedding). very laminated, well indurated.
54					Grey shale - took PSS-54 from very top of core; fossil at 305.25' Inoceramus at 305.5'; small brown encrustation at 306.75'; finely laminated, non calcareous matrix; Bentonite (2" thick) at bottom of core. NO dip on bedding. Inoceramus hash at 307'.

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SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED 10/7/14
RUN RQD _____
LOGGED BY Amy Freye

Depth	Interval		Lith	RQD	Description
	From	To			
PSS (55) shee sample from top of core	309	314	Black shale	53" 4' 5"	Shell fragments @ 309' 8", 310' 5", 312' 7", 314' 4" possible laminations? N2-N3 Med-dark gray grayish orange (10YR 7/4) @ 311' 2" No dip very well indurated entirely noncalcareous (except for shells)
shee sample from top	314	319	Black shale	54" (10' 4' 6")	Bentonite @ 315', 318' 1" (thin) thin laminae (tan-calcareous) throughout top 314' - 314.5' N2-N3 Med-dark gray shell bed @ 319' small shell fragments throughout very well indurated Slight dip @ 318' south (1-2°)
dropped core wooden marker (57) indicate section changed bit	319	324	Black shale	68"	from 322' 2" - 322' 8" N2-N3 Med-dark gray grayish orange bentonite @ 323' 6" No Dip
			Black shale		
	324	329	Black shale	44" 3' 8"	N2-N3 Med-dark gray No dip @ 10" & 21" Bentonite layers (thick (2.5" w/ concretions) Non calcareous - slightly in 10YR 7/4 layers throughout core Shell fragments throughout
59	329	334	Black shale	55" 4' 4"	N2-N3 Med-dark gray Shell fragments throughout bentonite 10YR 7/4 @ 330' Poor core recovery @ 332' Noncalcareous NO Dip

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CORE RUN # _____
PAGE ____ OF ____

SITE Presno
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED-INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED 10/8/14
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
(60) sample from top Not shoe	334	339	Black shale	41" 3' 5"	N2-N3 Med-dark gray shale shell fragments throughout @ 336' concretion Bentonite @ 339' (1.5") Non calcareous, No dip, very well indurated
(61)	339	344	Black shale	54" 4' 6"	N2-N3 Med-dark gray, poor recovery @ 343.5' shell fragments @ 341.5', 340.5' Disking @ 339-340' No Dip, Noncalcareous (All), No Bentonite
62 sample from top	344	349	Black shale	60" 5'	@ 346' Limestone circular, followed by irregular layers, then small bentonite. - burrowing? @ 345' + 347' N2-N3 Med-Dark gray - light gray 'wisps' @ 344-345 well indurated, Non calcareous, No Dip shell fragments throughout
(63)	349	354	Black shale	62" 5' 2"	Non calcareous No Dip light gray 'wisps' throughout shell fragments throughout Bentonite (very non calc.) 350' @ 3" thick N2-N3, very light gray well indurated N2-N3 med dark gray @ 350 (before bentonite, there is a shale bed. @ 354, tan wedge siltstone)
(64) No shoe sample	354	356	Black shale	1.5' 17.5"	N2-N3 Med-dark gray No dip, Noncalcareous shell fragments throughout gray 'wisps' after 355'

RESPEC
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CORE LOG DATA SHEET

CORE RUN # _____
PAGE **OF** _____

SITE Presho

CORE BARREL LENGTH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL 356 ft.

BOTTOM CORE INTERVAL 359 ft

LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED 9:22 a.m. #65
DATE RECOVERED 10/9/14
RUN RQD _____
LOGGED BY J.F. Sawyer

Core #	Depth	Interval		Lith	RQD	Description
		From	To			
65		356	359		41" 3'5"	No core, fishing, (no core), fish + redrill (41 inches) Medium dark gray (N3), hard, waxy, noncalcareous, inoceramus shells distributed throughout the whole core.
	1ft					@ 8" from top, worm burrow? (pale yellowish brown 10 YR 6/2, slightly calcareous)
	2ft					Slightly more fossiliferous from ≈ 6"-14" from top. + ≈ 28"-36" from top.
	3ft					More fissile @ 8"-14" + 28"-30" from top. * PSS-65 taken from shoe (at bottom of core sample), Horizontal bedding. No bentonites

CORE RUN # 66
PAGE 1 OF 1

RECOVERY _____
TIME RECOVERED 11:15 a.m.
DATE RECOVERED 10-9-14
RUN RQD _____
LOGGED BY J.F. Sawyer

Depth	Interval		Lith	RQD	Description
	From	To			
0	359	364	58.5 inches		Collected shoe sample PSS-66 from bottom of sample
			4'10.5"		Grayish black shale (N2), slightly waxy, noncalcareous
					Bentonite is medium gray (N5)
1'					Bentonite @ 13.5" - 13.75" 0.25 inches thick
					Bentonite @ 14.5" - 16" (1.5 inches thick) dipping slightly
					Bentonite @ 37" - 38" (1.0 inch thick)
2'					Bentonite @ 41.5" - 42" (0.5 inch thick)
					Fossil fragments (small) scattered throughout the core sample
3'					Fissile shale between bentonite layers @ 14.5" - 15.0"
					General quality of core sample is excellent
4'					

Core 68

369 - 374 ft

Time 1 hr 2 min

Recovery 4 ft 10" total (all 3rd year)
+ fish once

- Dark gray shale, w. numerous
- broken macrofossils (horizontal & semivertical) ic at 7", 9", 1' 2", 1' 3", 1' 11.5", 2' 1.5", 2' 8.5", 3' 9", 4' 1", 4' 5.5", 4' 10"

- with gray bentonites
1' 5.5" to 1' 7"

2' 5" to 2' 6.5"

2' 11.5" to 3' 1"

3' 3.5" to 3' 5"

? maybe at 3' 7.5"

- waxy, noncalc

shoe sample from bottom

10-15-14 Wednesday

Beautiful + warm! Windy afternoon.

Unload water truck + drive to Norris' in Pierre, leave for new water tank (minimum 1 week). Drive to DOT to borrow water tank - strap onto goose-neck trailer. Head to Presho - by 2pm drillstem down + (almost) coring.

Core 67
364 - 369 ft

[no SDSMT people here
pkg core w/o sealing
or argon

Time 1 hr 4 min

Recovery 5 ft 1" (all 3rd year)

- push out with water
- saved 2 bags of "overburden weekend" for Dan
- shoe sample from bottom

dk gray shale, w peachy fossils (see photos)
fragments at: 2.5", 4", 1' 9", 2' 8", 1' 3"
3' 6" 4' 9" 3' 10.5"

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN #

PAGE OF

10-16-204

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
379					
(70)				51"	Gray shale with rubble at top (not from yesterday's coring (not included in this 51" recovery). Take shale sample from larger piece of rubble at top. Brown 1" concretion at top in rubble. 1/2" bentonite at 381.5' (gray bentonites). Small brown concretion (1/4" thick by 1" long) at 383'. Very good concretion at 384' - 1" long.
384					
(71)				57"	Gray shale; Gray bentonites at 385' and 386' (5G 6/1). Irregular brown lenses at 385.5' (2 lenses - moderate brown 5 1/4") - - could be bentonite or concretion (?). Fracture (45°) in bentonite at 385. PSS-71 front of core.
389					
(72)				62"	Gray shale N4 - no concretions no fossils, secondary bentonite 10G 7/2 5G 5/2 Bentonite 2" thick at 391' with color banded (colors as shown above). PW G taken from top of core.
394					

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RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED 75°
RUN RQD 50%
LOGGED BY JAN

10-20-14

Depth	Interval		Lith	RQD	Description
	From	To			
394					
(73)				57"	fine to 15" then more no shaly magnetic gray mudstone 1/4" bent @ 13" followed by seam of green (glauco?)
399					[ps-73 from bottom]
(74)				7.5" to 6" N4/N3	mudstone/claysh 1/4" bent @ 1"
404					1/4" old g.
				to 41" 54 512	calcareous
				irregular beddy mixed of color range + 51'	+ 44" mudstone
					54 712 siltstone still calc
				bottom somewhat fissile	N4/N3 1/2" green ls @ 59"
					NON-calc small concretions (1/2") @ 57"
					bent seam @ 69"
					green seam @ 77 1/2"

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE _____ OF _____

SITE Prosho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY 10-21-14
TIME RECOVERED _____
DATE RECOVERED sim 75'
RUN RQD _____
LOGGED BY jen windy

Depth	Interval		Lith	RQD	Description
	From	To			
404					de gry de drn gy best scan @ 29 1/2" shell
(75)				54.5"	claysh/mudstone non-calc 36"
409					1 1/2" marl/concretion @ top ← PSS-75
(16)				65.5"	de gry fide 1/2" bent @ 26" Occasional - marl 1/2" @
414					conc @ 9", 17", 39", 49" core?
(77)				47 1/2"	prtle @ top incl 1/2" flt clast PSS-77 top
419					de gry 1/2" to 1 1/2" conc throughout
(18)				65"	Still somewhat fissile to 30", redilled or damaged core to 100% marl
424					then shale/claysh numerous benthic conc
(79)				58.5"	de gry friable shale bent: 1/2" @ 3" 1/2" @ 12"
429					conc: 1/2" @ 8 1/2" 1/2" @ 7 1/2" 1/2" @ 13"
					1" @ 40" 1/2" @ 11" 1/2" @ 5"
					rich w/ shells @ 57"
					shells/loam to 2" bent 1/2" @ 9 1/2"
				66 1/2"	fine shale 2 1/2" @ 28"
					1" conc @ 15" bit green in the
					1/4" conc @ 37 1/2" 1" @ 56"
					1" @ 48 1/2"

CORE LOG DATA SHEET

CORE RUN #

PAGE OF

Presko

(REL LENGH

BARREL DIAMETER

ORE INTERVAL

OM CORE INTERVAL

4.2.2.2. LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

Depth	Interval		Lith	RQD	Description
	From	To			
439			PS - Bottom	53"	dk gr. shak non calc 5" bent w/ green streaks @ 2" interval @ 40' abundant 1" conc @ 10", 1/2" @ 17", 1" @ 31" moder. 1" conc, interval @ 34", 1/2" @ 43" @ 25"
444			PS - Top	59"	dk gray fissile shale some greenish layers 1 1/2" conc @ 15" 2" conc @ 45" 2" conc @ 57" fissile shale pyrite lenticular 1" lent. conc. @ 9" 1" bent. @ 18" ← dr green 1/2" lent. conc. @ 78" silt & pepper fine sand seam @ 7 1/2"
449				56"	
					Having trouble with the core catcher. Need to fish multiple times to retrieve full core run. lower core is damaged. Stopping for week until new core rig is come in.

RESPEC

CORE LOG DATA SHEET

CORE RUN # _____

PAGE OF

10-27-2014

SITE Fresh

CORE BARREL LENGH _____

CORE BARREL DIAMETER _____

TOP CORE INTERVAL _____

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL _____

RECOVERY _____

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

Depth	Interval		ROD	Description
	From	To		
(84)			45"	1" tan Concretion (?) at top; grey shale; fossil hash at 452'; thin concretion at 452.5' (1/4" thick); vague concretions (2) at 453.5' (2 1/2" thick each).
(85)			67"	Greys shale with many bentonites (?) layers (~ 4 layers per foot), non calc. non fossiliferous. PW-10 taken from top of core.

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE _____ OF _____

10-28-2014

SITE Reservoir
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
86				46"	Grey shale with many concretions (~1/2 per foot) 61 min Coring Time @ 10:33 Fracture at 462.5'
87				55"	Grey shale with many concretions 64 min Concretions ~ 1/4 - 1/2" thick and ~ 1.5" in diameter. Concretions ~ 4-5 per foot. Concretions yellowish grey 5Y 7/2; a few shells; non calcareous matrix
88				14"	Recovered 7" of dark shale N3 - no concretions; No recovery Very indurated - going back in to try at 1323 - going to recover more. Top section of 7" has a back in. Pyrite-rich worm burrow (?) approximately 1/2" in width though these are more common on further investigation. May just be associated with bedding. Recovered additional 7" of light grey very calcareous material. <u>OTD</u> with less calcareous at top and bottom (calcareous bed ~ 4" thick) - very indurated (very). Put all Core into PW-11 (top) and PW-12 (bottom with carboniferous).

474

Top 88C = PW-13
Bottom 88C = PW-14
PSS-88C
Supplemental
Sample
from
bit

Core 88a = PW-11 Core 88b = PW-12
Recovered additional 1ft out of pipe after
pulling rods. Not known exact
footage called 88C

RESPEC

CORE LOG DATA SHEET

CORE RUN # _____

PAGE OF_____

SITE Pres Lo

CORE BARREL LENGTH

CORE BARREL DIAMETER _____

TOP CORE INTERVAL

BOTTOM CORE INTERVAL _____

LENGTH CORED INTERVAL

10-29-2014

RECOVERY

TIME RECOVERED _____

DATE RECOVERED _____

RUN RQD _____

LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
89 63" 64"					Greysile matrix with many fan concretions (~12 per ft). Three inch limestone bed at 475' and another at 478.5'. The lms at 478.5 has an irregular bottom contact which varies in thickness from two inches to 1/2".

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

11-4-2014

SITE Pres L
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
488				60"	Grey shale N3; Bentonite layers frequent; Bentonite ~ 6-7 per foot (appears to be bentonite as opposed to concretions). Bentonite slipped/separated at 488' with shale filling slip plane. From 486.5 to 489 calcareous matrix. well indurated throughout. Small nodules (~1-2mm) occur throughout, may be small phosphate(?) nodules based on literature.
492				63"	Grey shale with many tan bentonite(?) layers. Tan layers show effect of soft sediment deformation because they are irregular and appear to have incorporated shale commonly. Fossil hesh zones at 491.5 and 492. The hesh zone at 491.5 has considerable pyrite whereas the hesh zone at 492 does not seem to have much. A small "tepee" structure occurs at 492 + it is formed from inoceramids(?) plates. But calcareous in both tan and grey.
494				66"	The "phosphate(?) nodules also occur in this core but have calcareous component. Nodules may be large forams?
499					Grey shale N3; Bentonite layers less frequent but still common (~7 per ft); small nodules, white, round; Fossil hesh zone (1/4" thick) at 495.75'. Shale matrix is non-calcareous. Shale appears waxy and moderately well indurated (not as hard as previous cores). The small nodules are calcareous, could the nodules be forams(?)
					498.5 PW-15 from Bottom (just above shoe sample)

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RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

11-4-2014
RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
504				46"	Grey shale with irregular tan layers; Tan layers ~ 1/8" to 3/4" thick. In outcrop, the tan layers may appear to be mottled, perhaps. Small (1mm) round spherules common. Tan layers less common above 502 ft. In general, non calcareous but some matrix calcareous above 501'. Appears to be transition at 502' to less tan units.
509				77"	Grey shale with numerous tan, irregular layers. Some, but not all, tan layers are calcareous. Seems to be a marl. Augen structure in tan layers are filled with pyrite. These structures may be similar to Schieber (2011) who says due to oxygen events in black shales. Fracture at 505.5' showing brecciation and filling with pyrite. Fracture developed in limestone layer 8" thick - PW-16 from top of core.
514				51"	Grey shale with many small white spherules. Perhaps the spherules are small fossils as they are calcareous. Augen at 512. Augen may be the result of differential compaction. The pyrite fill may be due to a worm burrow(?). Tan layers are calcareous varying between some and much-marls.

RESPEC

CORE LOG DATA SHEET

CORE RUN #

PAGE OF _____

11-5-2014

SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

Depth

Interval

From

To

Lith

~~RQD~~

Description

Grey shale N3; Tan concretions sometimes
calcareous; shale is fissile; Tan is
calcareous at 5/8 but not at 5/7 or
5/6; Tan concretions have iron sulfide
"eyes" at iron sulfide Greyish orange
tan concretions 10 YR 7/4

- fished for additional core;
rephotographed.

519

RESPEC
RAPID CITY, SD

CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

SITE Presho
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

11-5-2011
RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
98				62"	Grey shale N3; Tan concretions - <u>iron sulfide</u> with iron sulfide centers 522.5' concretion; 522 concretion; 521.5' concretion; 520' concretion; none calcareous matrix and only the concretions at 522.5' and 522 have a small amount of calcareous material. seems to be moderately fissile. small Sulfide burrow(?) at 520'; suggestion was made that concretions may be phosphate(?) based on literature and context.
524				59.5"	Greys shale N2; Bottom 4' has more fissility than previous cores; Tan nodule at 525.5'; Pelecypod fossil at 526.5'; parts easily into smaller pieces; nodules at 528.
529					

RESPEC
RAPID CITY, SD

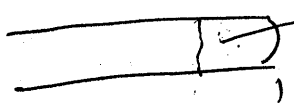
CORE LOG DATA SHEET

CORE RUN # _____
PAGE ____ OF ____

SITE Freshwater
CORE BARREL LENGTH _____
CORE BARREL DIAMETER _____
TOP CORE INTERVAL _____
BOTTOM CORE INTERVAL _____
LENGTH CORED INTERVAL _____

11-5-2014

RECOVERY _____
TIME RECOVERED _____
DATE RECOVERED _____
RUN RQD _____
LOGGED BY _____

Depth	Interval		Lith	RQD	Description
	From	To			
100				61.5	Black shale N2; many horizontal Partings; fissile; concretions at 533.5' very complex  lighter color; perhaps siliceous
					 siliceous? more indurated than upper core.
					At 532 small concretion that is calcareous at its base.
					PSS-100 from top of core.
534				57	Black shale N2; one small concretion fen at 538.75'; non calcareous; generally non fossiliferous; fissile but
					PW-17 from top.
539					

RESPEC

CORE LOG DATA SHEET

CORE RUN #

PAGE OF__

SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

·RUN RQD

LOGGED BY

11-5-2014

Depth	Interval		Lith	RQD	Description
	From	To			
102					Grey shale 102; small concretion at light area at 543.5 that is calcareous (about 5" thick) and 642' also calcareous (about 3" thick). PW-18 from bottom. PSS-102 from top

RESPEC

CORE LOG DATA SHEET

CORE RUN #

PAGE OF_____

11-6-2014

SITE

CORE BARREL LENGTH

CORE BARREL DIAMETER

TOP CORE INTERVAL

BOTTOM CORE INTERVAL

LENGTH CORED INTERVAL

RECOVERY

TIME RECOVERED

DATE RECOVERED

RUN RQD

LOGGED BY

Depth	Interval		Lith	ROD	Description
	From	To			
103					Black shale N2; Light grey layer at 524.5' ~ 2" thick. 1" thick zone of white speckles at 546.75' about 1" thick; light grey zone at 548.5' about 3" thick. Probably bentonite although it is slightly calcareous. Appears to have picked up some core (upper part of this core) from previous run because has cone crater tooth marks on upper part of H.L. core.