

LITHOLOGIC DESCRIPTION OF COREHOLE CE-708

Located 1218' FNL and 1039' FEL Sec. 5, T2S, R99W
 Rio Blanco County, Colorado
 Ground Elevation 6918', Kelly Bushing 6928'

From	To	Description
0'	5'	Alluvium, sandstone, siltstone, marlstone, light buff to medium brown, bits of oil shale.
5	10	As above.
10	15	As above.
15	20	As above.
20	25	As above.
25	30	As above.
30	35	As above.
35	40	As above.
40	45	As above.
45	50	As above.
50	55	As above.
55	60	As above.
60	65	As above.
65	70	As above.
70	75	As above; (geolograph indicates bedrock surface at 72').
75	80	As above; (suspected cavings from above hole).
80	85	Siltstone gray brown, sandstone medium brown, thinly bedded, marlstone, light brown, slightly varved.
85	90	Marlstone, dark brown, (lean oil shale), to light brown, siltstone, light buff to brown.
90	95	Oil shale, dark brown, varved, concoidal fracture, siltstone, light brown to medium brown and marlstone, light brown.
95	100	Oil shale, dark brown, varved, concoidal fracture.
100	105	Missing.
105	110	Oil shale, dark brown to medium gray brown, varved.
Core #1	114' to 115.5'	Cored 1.5' Recovered 1.5'
114.5	115.5	Oil shale, medium brown, varved, scattered, very thin lenses of carbonized plant fragments.

From	To	Description
Core #2	115.5'-121.5'	Cored 6' Recovered 6'
115.5'	116.4'	Oil shale, medium brown, varved; scattered very thin lenses of carbonized plant fragments.
116.4	117.05	Oil shale, dark brown, varved, marly; some thin blebs of tuff, scattered very thin lenses of carbonized plant fragments
117.05	117.7	Oil shale, dark brown to dark gray brown, varved, marly, scattered thin tuff lenses; some high angle fractures with thin calcite in fill.
117.7	120.0	Oil shale, medium brown, varved, marly (lean oil shale); badly fractured, with some calcite, fracture in fill.
120.0	121.5	Oil shale, medium brown, varved; high angle fractures; with thin calcite fracture in fill; thin blebs of tuff, some analcitized at 121.1'.
Core #3	121.5'-126.7'	Cored 5.2' Recovered 5.2'
121.5	124.1	Oil shale, medium brown, varved; high angle fractures, with thin calcite fracture in fill; thin lens of tuff at 123.6', 1/4" thick.
124.1	124.75	Oil shale, dark brown, varved, marly; slightly banded with dark bands.
124.75	126.7	Oil shale, medium brown, varved; some very thin lenses of tuff, some analcitized.
Core #4	126.7'-144.3'	Cored 17.6' Recovered 15.05'
126.7	133.1	Oil shale, varved medium green brown to dark green brown, marly, blebs of tuff (calcareous) throughout unit, some of tuff blebs are analcitized, core exhibits eye like lensing around some of the blebs.
133.1	133.2	Marlstone, light brown, varved.
133.2	134.8	Oil shale, varved, dark green brown to medium brown, thin marlstone blebs with eye like deformation around them, large bleb of analcitized tuff at 134.1'.

From	To	Description
134.8'	139.1'	Oil shale, varved light brown to dark green brown, banding effect, marly blebs of tuff throughout unit. Thin analcitized tuff at 137.9', bleb of tuff at 138.4'.
139.1	141.8	Marlstone, varved, light brown to medium brown badly fractured and broken, dark brown film on fracture surfaces, slightly kero-genetic.
141.8	144.3	Missing.
Core #5	144.3'-153.0'	Cored 8.7' Recovered 8.9' (Pieces from above missing core)
144.3	147.7	Dolomite, varved, light to medium brown, interbedded with medium green brown oil shale. Slump structure exists at 147.7', unit fractured and broken with dark brown organic type material on fractures. Large vug of analcite at 144.5'. Irregularly bedded, marly tuff at 145.5', 0.1' thick.
147.7	152.5	Dolomite, varved, gray brown to medium brown, unit has high angle fractures with pyrite on the fractures. Small vugs occur locally, largest one at 149.9'.
152.5	153.0	Oil shale, medium green brown, interbedded with thin, irregular beds of analcitized tuff, vugs occur near the presence of an irregularly bedded tuff at 152.6'.
Core #6	153.0'-155.7'	Cored 2.7' Recovered 2.7'
153.0	153.6	As above, unit 152.5'-153.0'.
153.6	154.3	Dolomite, medium to light brown, interbedded with siltstone, large vug at 154.2' lined with small pyrite crystals.
154.3	155.1	Oil shale, varved dark green brown to medium green brown, largest of irregularly bedded tuffs at 155.1'.
155.1	155.7	Oil shale, varved dark green brown, waxy lustre, lensing "eye like" bedding structure.

From	To	Description
Core #7 From 155.7' to 164.1' Cored 8.4' Recovered 8.0'		
155.7'	156.4'	Oil shale, varved dark green to light brown green, lensing "eye like" structures.
156.4'	156.55'	Tuff, analcitized, steel gray.
156.55'	159.0'	Oil shale, varved dark green brown to light brown, thin irregular beds and blebs of analcitized tuff throughout unit.
159.0'	159.7'	Oil shale, varved dark green brown to medium brown, lensing "eye like" structures.
159.7'	160.3'	Oil shale, interbedded with irregular bedded analcitized tuff, some slump type structures, (enterolithic) associated with the tuffs, 0.1' thick analcitized tuff at 159.8'.
160.3'	160.4'	Tuff, buff, irregular bedded.
160.4'	162.4'	Oil shale, varved light brown to dark brown, thin irregular bedded analcitized tuffs throughout unit.
162.4'	163.7'	Oil shale, varved dark brown to light brown, bleb zones of analcitized tuff at 163.4' and 163.6' local deformation of oil shale around blebs. Blebs are vuggy.
163.7'	164.1'	Missing
Core #8 From 164.1' to 185.0' Cored 20.9' Recovered 20.7'		
164.1	165.7	Oil shale, dark to medium brown, varved, dolomitic; thin lenses of tuff analcitized 1/8" @164.9', 1/4" @165.3', tuff lenses are vuggy
165.7'	166.8'	Oil shale, dark to medium brown, varved; highly fractured and deformed around lenses of analcitized tuff, tuff lenses of 1" @165.7' & 1/4 to 1/2" @166.4'; a mass of deformed thin tuff lenses from 166.1' to 166.3'.
166.8'	170.8'	Oil shale, medium brown with some dark brown with reddish tint, varved, marly; some scattered thin blebs of analcitized tuff. A carbonized leave fragment @169.9'
170.8'	174.2	Oil shale, as above, more medium to light brown, some leave fragments.
174.2'	174.75'	Tuff, gray, analcitized, vuggy on core surface; (Mahogany Marker); oil shale 1/2 to

From	To	Description
		1" thick @174.25'. Mahogany Marker 6 to 6-1/2" thick.
174.75'	179.1'	Oil shale, varved, medium to light brown, marly; some scattered very thin lenses of analcitized tuff, a thick lense 1" to 1-1/2" of analcitized tuff @ 179.1'.
179.1'	180.1'	Oil shale, dark brown, varved, slightly argillaceous.
180.1'	181.5'	Oil shale, dark to medium brown, slight reddish tint, varved; some thin blebs of analcitized tuff.
181.5'	184.8'	Oil shale, medium to dark brown reddish tint, varved marly, some dark banding from 184.5' to bottom; scattered blebs of analcitized tuff @181.8'; scattered plant fragments.
184.8'	185.0'	Missing core
Core #9 From 185.0' to 213.0' Cored 28.0' Recovered 26.85'		
185.0'	185.5'	Oil shale, medium brown, varved, marly; thick blebs of analcitized tuff about 1/4 to 3/8" thick with irregular bedding around blebs.
185.5'	186.4'	Oil shale, dark brown to steel gray, varved, dolomitic; analcitized tuff lenses 3/4" thick @185.85'
186.4'	187.0'	Oil shale, medium to reddish brown, varved, marly
187.0'	188.5'	Oil shale, dark brown, varved, marly; some fracturing, breaking into thin plates.
188.5'	188.95'	Oil shale, dark brown, varved, dolomitic; lense of analcitized tuff 1/2" thick @188.85'.
188.95'	190.0'	Oil shale, dark brown, varved, dolomitic; lenses of analcitized tuff 1/4" thick @189.0', 1/8" @189.2', 1/8" @189.3' some other thin tuff lenses from 189.0' - 189.5'; irregular varving with truncated varves and eye-like structures.
190.0'	192.5'	Oil shale, dark brown banded medium brown, varved, banded zones of dark more dolomitic, lighter more marly

From	To	Description
192.5'	193.65'	Oil shale, medium brown, varved, marly; some very thin lenses of analcitized tuff.
193.65'	195.9'	Oil shale, dark brown, varved, very rich, dolomitic (possible Mahogany bed); 3/4" lenses of partially analcitized tuff @194.7'.
195.9'	196.7'	Oil shale, dark to medium brown, varved, some irregular varving; very thin lenses of analcitized tuff, scattered throughout unit.
196.7'	197.4'	Oil shale, dark brown, varved, dolomitic; thin blebs of analcitized tuff.
197.4'	199.8'	Oil shale, dark brown, varved, dolomitic; thin blebs of analcitized tuff.
199.8'	201.3'	Oil shale, dark brown, varved, dolomitic; interbedded with thick lenses of tuff as thick as 1" some analcitized.
201.3'	203.0'	Oil shale, dark brown, varved, dolomitic to marly, dark to lighter in color; enterolithic structures, slumping features
203.0'	203.6'	Oil shale, dark brown, varved; 1/4" thick tuff lenses analcitized in lower 3", numerous blebs of analcitized tuff very thin.
203.6'	205.8'	Oil shale, dark brown, varved; thin lenses analcitized tuff, 1/2" lenses @205.1'
205.8'	209.6'	Oil shale and tuff, enterolithic, (slump), structure, tuff is analcitized; dendritic patterns of mineralization
209.6'	211.8'	Oil shale, medium brown, varved, marly; lenses of tuff 3/4" thick @211.15', 1/4" @211.2', 2" @211.3'.
211.8'	213'	Missing core
Core #10	213.0' to 225.4'	Cored 12.4' Recovered 11.7'
213.0'	214.3'	Oil shale, varved, dark green brown to medium green brown, marly, lensing "eye like" structures of varves.
214.3'	214.6'	Oil shale, varved, dark brown to black, dolomitic, lensing "eye like" structures.
214.6'	214.7'	Dolomite, dark brown, massive
214.7'	215.2'	Oil shale, varved, dark brown to light brown, marly to dolomitic.
215.2'	215.8'	Oil shale, dark brown to black, dolomitic with

From	To	Description
		irregular bedded brown tuffs approx. .05' thick at 215.2', 215.3', 215.6' and 215.8'.
215.8'	216.3'	Marlstone, medium brown, (lean oil shale), varved to laminated.
216.3'	217.8'	Oil shale, varved, dark green brown to light brown, blebs of tuff one of larger at 216.5', marly, very thin layers of calcite on bedding planes and around blebs.
217.8'	218.7'	Marlstone, medium brown, badly fractured and broken.
218.7'	219.5'	Oil shale, varved, dark brown, marly, very small bleb of tuff.
219.5'	221.3'	Oil shale, dark brown, slightly varved, small blebs of brown tuff.
221.3'	224.0'	Oil shale, interbedded with thin irregular bedded tuffs, enterolithic slump structures throughout unit, some vugs and veinlets of calcite, large vug of analcitized tuff at 223.9'.
224.0'	224.7'	Oil shale, varved, dark green brown to medium green brown, few thin layers of analcitized tuff.
Core #11	From 225.4' to 234.6'	Cored 9.2' Recovered 9.1'
225.4'	234.5'	Oil shale, varved, dark green brown to medium brown, marly, lensing "eye like" structures, blebs small and light brown throughout unit. Unit is badly fractured and broken at 229.5', 231.0', 233.5' and 234.0'.
Missing 234.5' - 234.6'		
Core #12	From 234.6' to 248.8'	Cored 14.2' Recovered 13.6'
234.6'	236.0'	Oil shale, varved, dark brown to light brown, bleb of tuff (brown) at 236.0'.
236.0'	246.4'	Oil shale, varved, medium brown to dark green brown, some banding of colors, marly, analcitized tuffs located at 238.9', 240.7', 241.2', 241.8', 243.9', 243.4', 244.7'. The 241.2' tuff is vuggy. Fracture area around 239.6' has reddish film on fracture surfaces

From	To	Description
246.4'	247.0'	Oil shale, varved dark brown to black, oil shale of this unit has tendency to disc.
247.0'	248.2'	Oil shale, varved dark green brown to buff, lensing "eye like" varves, thin irregular bedded tuffs within unit, bleb of analcitized tuff at 248.0'.
248.2'	248.8'	Missing
Core #13	From 248.8' to 260.3'	Cored 11.5' Recovered 9.6'
248.8'	250.4'	Oil shale, varved medium green brown to medium brown, marly to dolomitic.
250.4'	252.6'	Oil shale, varved dark brown to dark green brown, marly, few blebs of tuff, lensing of varves produce "eye like" appearance. Thin irregular bedded tuffs at 250.8' and 251.7'.
252.6'	256.8'	Oil shale, medium brown, marly, slump and enterolithic structures throughout unit, lower part of unit is badly fractured with calcite and or aragonite on fracture surfaces. Upper part of unit is vuggy, numerous veinlets of calcite in vuggy locale.
256.8'	258.3'	Oil shale, varved medium green brown to light brown, few small blebs of light brown tuff, lensing of varves producing "eye like" structure, marly, thin irregular bedded tuff at 257.3'.
258.3'	258.4'	Tuff, brown, covered with light brown to buff bentonite, lower part of unit is missing probably due in part to the presence of more bentonite.
258.4'	260.3'	Missing
Core #14	From 260.3' to 272.1'	Cored 11.8' Recovered 11.8'
260.3'	262.1'	Oil shale, dark brown, varved, lenses of tuff 1/4" @260.6', 1-1/4" @260.7', 1/4" @261.35', highly fractured zones 4" thick @260.6', 4" thick at 261.7'.
262.1'	264.7'	Oil shale, dark brown, varved, enterolithic structures, slumped and irregular bedded, some small vugs; some small cavities at top; thin lenses of tuff scattered.

From	To	Description
264.7'	268.6'	Oil shale, dark brown to medium dark brown, varved, badly fractured, with high angle fractures; numerous lenses of tuff 1/4" to 1/2" @265.0', 1/2" @265.3', 1.5" @266.3'; some irregular slanted bedding @265.7' to 266.0'.
268.6'	268.8'	Oil shale, dark brown, varved, segregated crystals of calcite.
268.8'	271.7'	Oil shale, dark brown, varved, highly fractured, numerous fracture cavities; numerous small vugs, some solution cavities; badly broken.
271.7'	271.85'	Oil shale, dark brown, varved, numerous segregated crystals of calcite.
271.85'	272.1'	Oil shale, dark brown, varved, vuggy; 1/2" zone of segregated crystals of calcite.
Core #15	From 272.1' to 288.0'	Cored 15.9' Recovered 13.6'
272.1'	272.5'	Oil shale, dark brown, varved, segregated crystals of calcite.
272.5'	273.4'	Oil shale, medium brown, varved, marly, vuggy, with fracture cavities.
273.4'	274.6'	Oil shale, dark brown, varved, small vugs in segregated zones in lower 4" with possible calcareous lenses of analcitized tuff 1/2" to 1" thick @273.45', several 1/4" lenses from 273.5' - 273.75'
274.6'	285.7'	Marlstone, medium to dark brown, kerogenetic, some varved, ("B - Groove"), numerous small vugs less than 1/4" thick, numerous solution cavities 2-1/4" in diameter, some with calcite crystals, entire section badly fractured highly broken up; 1.5" zone of segregated calcite crystals @279.45'; section from 280' to 285.7' has fewer solution cavities mostly vugs; section with high angle fractures; lower most 2' appears more affected by solution.
285.7'	288.0'	Missing core
Core #16	From 288.0' to 308.5'	Cored 20.5' Recovered 15.5'

From	To	Description
288.0'	291.6'	Marlstone, medium to dark brown more kerogenetic than above, some varved; fractured with high angle fractures, some vugs less than unit above; more of a lean oil shale than above section.
291.6'	292.5'	Oil shale, dark brown to medium brown, varved, lower 6" almost a marlstone; lower section highly fractured and vuggy.
292.5'	293.6'	Oil shale, dark brown, varved, dolomitic 1/4" blebs of partly analcitized tuff @293.1'.
293.6'	297.7'	Oil shale, medium to light medium brown, varved, marly; high angle fractures, some vertical, entire section badly broken, some solution along fractures, creating cavities, some sections are vuggy; section from 292.35' - 297.5' is zone of enterolithic bedding possible slump features. Tuff lenses 2" to 3" @297.1' & 297.4'.
297.7'	299.6'	Oil shale, medium brown, varved, marly; irregular varving with eye-like structures, and angular varves; high angle to almost horizontal fracturing with some solution along small fracture creating cavities; tuff lenses 1/4" @298.2' and 298.8' partially analcitized.
299.6'	303.5'	Oil shale, medium to light brown, varved, very marly; badly fractured and broken, high angle fracture very irregular; fracture cavities and vugs lower 4" very friable; tuff lenses 1" thick @300.1', 1.5" to 3" @300.2', 1.5" to 2" @300.9' partially analcitized.
303.5'	308.5'	Missing core
Core #17	From 308.5' to 335.0'	Cored 26.5' Recovered 25.4'
308.5'	310.1'	Oil shale, dark to medium brown, varved, marly, lenses of tuff 1/2" thick @308.85', 309.85' and 309.9' bleb of tuff @310 analcitized.
310.1'	313.25'	Oil shale, medium to dark brown, varved, marly; lenses of tuff 1/2" thick @310.45' analcitized, 1/4" thick @312.6' large solution cavity with slump feature @311.4'; sections of unit are highly fractured.

From	To	Description
313.25'	319.0'	Oil shale, varved, dark greenish brown to green, marly; lenses of tuff analcitized 1" thick @313.7', 1" thick @313.9'; 1" thick @316.9', zone of reworked material 2.5" thick @315.15'; some reddish stain on fracture surface; irregular bedding around tuff lenses.
319.0'	324.95'	Oil shale, varved dark brown with greenish tint to medium brown, marly; banded with medium brown unit at top 1.3'; large solution cavities @320.7', solution cavities @322.4' 1" thick and 1.5" thick @322.6', reworked and irregular bedding around cavities; scattered lenses of analcitized tuff, 1/2" lense @324.9', scattered thin streaks of pyrite.
324.95'	325.4'	Tuff, irregular bedded, analcitized, apparent porosity and permeability.
325.4'	326.35'	Oil shale, varved medium to dark brown, banded medium brown @ top, dolomitic; blebs of buff colored dolomite.
326.35'	329.7'	Oil shale, medium brown, varved medium dark brown, marly; solution cavity 2.5" thick @327.8'; irregular bedding (slump feature), @327.6' and around solution cavities; some thin analcitized tuff lenses in irregular bedding zone; some "eye-like" structures @329.2'; some truncated varves.
329.7'	332.7'	Oil shale, varved dark brown to medium greenish brown, dolomitic; lenses of analcitized tuff 1/4" thick @330.1', 1/2" thick @330.95', 1" thick @332.3', 1" thick @332.35', dolomite interclasts 1/4" thick @331.1'; irregular bedding, some "eye-like" varve features, some truncated varves.
332.7'	333.9'	Oil shale, varved dark brown to medium brown to light brown, marly.
333.9'	335.0'	Missing core
Core #18	From 335.0' to 344.8'	Cored 9.8' Recovered 7.9'
335.0'	336.9'	Oil shale, varved dark brown to medium brown, marly, tuff blebs 1/4" thick @336.3', lenses of tuff (analcitized), 1/2" thick @336.6', some "eye-like" structures.

From	To	Description
336.9'	337.3'	Tuff, gray to dark brown, with dark brown colored replacement calcite, tuff is analcitized.
337.3'	341.8'	Oil shale, varved dark brown to medium brown, dolomitic, large solution cavities; interbedded blebs of analcitized tuff.
341.8'	342.9'	Marlstone, medium to light brown, some slight varving, slightly marly; badly fractured and broken, (lean oil shale).
342.9'	344.8'	Missing core
Core #19	From 344.8' to 374.3'	Cored 29.5' Recovered 29.2'
344.8'	345.3'	Marlstone, varved light brown to medium green, fine laminations of black organic material near top of unit, blebs of analcitized tuff.
345.3'	346.15'	Oil shale, varved dark brown to medium brown, interbedded with very thin lamina of tuff.
346.15'	350.1'	Oil shale, varved dark brown to medium brown, marly to dolomitic, irregular layers of analcitized tuff at 346.2', 346.5', and 346.9'; very thin layers of pyrite in upper part of unit.
350.1'	351.1'	Oil shale, medium brown, waxy to dull lustre, dolomitic.
351.1'	352.0'	Marlstone, varved medium green to light brown, top of unit has irregular bedded tuff 0.35' thick.
352.0'	352.9'	Oil shale, medium green brown, varved, interbedded with irregular bedded carbonaceous material, blebs of tuff with slump (enterolithic) structure around blebs.
352.9'	353.9'	Oil shale, varved dark brown to black marly to dolomitic; bleb of dark analcitized tuff at 353.4' lensing "eye like" structures near bottom of unit.
353.9'	356.75'	Marlstone, varved medium green to light brown, blebs of tuff and slightly vuggy near bottom of unit. Very thin laminations of tuff "robin's egg blue" in color.
356.75'	362.7'	Oil shale, varved dark green brown to light brown, banding between dark and light colors.

From	To	Description
362.7'	370.5'	Some thin bands of buff siltstone. Blebs of tuff throughout unit, lensing of varves. Marlstone, light brown, slightly varved, interbedded with thin kerogenitic zones. Middle of unit is badly fractured and broken, crimson red film on some of the fracture surfaces, pyrite streaks common. Vug filled with tuff and pyrite at 370.2'.
370.5'	373.0'	Oil shale, dark green varves irregular bedded with light brown varves, blebs of tuff, truncated varves and lensing of varves, blebs of analcitized tuffs at 372.0', 372.8'.
373.0'	374.1'	Oil shale, medium brown, interbedded with marlstone, light green to brown. Slump structure near bottom of unit with some MnO ₂ dendrites.
374.1'	374.3'	Missing
Core #20	From 374.3' to 394.7'	Cored 20.4' Recovered 15.1'
374.3'	374.8'	Oil shale, brown fragments of broken and fractured oil shale.
374.8'	375.4'	Marlstone, light brown to buff, slump structure, and slump breccia with gilsonite emplacement.
375.4'	377.5'	Oil shale, varved dark brown, upper part of unit has waxy lustre, blebs of tuff and lensing of varves in bottom part of unit.
377.5'	380.6'	Marlstone and oil shale, badly broken and fractured, <u>some pieces vuggy</u> ; some vugs of calcite.
380.6'	381.5'	Marlstone, varved medium green to medium brown.
381.5'	389.2'	Oil shale, varved, dark brown to medium brown, interbedded with marlstone light brown. Marlstone is characteristically vuggy. Oil shale near middle of unit has segregated small crystals of calcite and some calcite veinlets. Small tuff blebs are common.
389.2'	394.7'	Missing

From	To	Description
Core #21	From 394.7' to 428.4'	Cored 33.7' Recovered 31.4'
394.7'	399.0'	Oil shale medium brown, interbedded with light brown marlstone. Marlstone at bottom 1/2 of unit, oil shale upper 1/2 of unit. Unit is badly fractured and broken, order can not be ascertained.
399.0'	399.1'	Marlstone, gray brown, hacky fracture, some pyrite streaks.
399.1'	401.55'	Oil shale, dark brown, varved, unit is mostly irregular bedded, with blebs of light brown tuff common, slump structure is exhibited near bottom of unit.
401.55'	413.7'	Oil shale, varved medium green brown to light brown, banded colors, dark and light. Bleb of analcitized tuff at 409.6', irregular bedded tuff at 409.7'; zones of segregated crystals of calcite at 410.3', 410.9', 411.4', 411.8', 412.4'.
413.7'	418.8'	Oil shale, medium brown, interbedded with irregularly bedded analcitized tuffs; unit has slump structures associated with irregularly bedded tuffs. Pyrite accompanies the tuff.
418.8'	425.0'	Oil shale, medium brown, interbedded with gray brown marlstone zones of segregated crystals of calcite at 420.2', 421.3', 421.8', 422.1', 423.3', lower part of unit from 423.6' to 425.0' has slump (enterolithic) structure with calcite marbeling along the irregular bedding.
425.0'	426.0'	Siltstone, tuffaceous, with clay associated, bottom of unit is probably missing, pyrite veinlets. Areas most calcareous are vuggy.
426.0'	428.4'	Missing.
Core #22	From 428.4' to 459.7'	Cored 31.3' Recovered 31.7'
428.4'	435.0'	Marlstone, light brown to medium brown, slightly varved, interbedded with lean oil shale, irregular bedding common, fractured and broken rock at 434'; tuff, brown, at 431.3', upper part of unit has dendrites of calcite with some solution evidence.

From	To	Description
435.0'	459.7'	Marlstone, brown to gray brown, interbedded with lean oil shale. Marlstone is characteristically vuggy with pyrite linings; segregated elongated crystals of calcite common with lean oil shale, layers of tuff only locally. Fractured and broken at 449.0', 457.0', and 459.0'. Reddish film on surfaces of fractures in fractured zones.
Core #23	From 459.7' to 470.0'	Core 10.3' Recovered 4.7'
459.7'	461.0'	Oil shale, gray dark brown, varved, argillaceous, almost shale; some thin blebs of analcitized tuff.
461.0'	461.6'	Marlstone, light brown, some slight varving, inclusions of calcite 1/4" thick and less comprising as much as 20% of the rock.
461.6'	463.4'	Marlstone, medium to light brown slight varving, banded with some thin oil shale stringers; badly broken.
463.4'	464.4'	Mudstone, gray, soft, friable, slightly calcareous, badly broken.
464.4'	470.0'	Missing.
Core #24	From 470.0' to 480.4'	Cored 10.4' Recovered 10.4'
470.0'	470.4'	Oil shale, green to medium brown, argillaceous, varved, lean.
470.4'	471.9'	Claystone, light gray to brownish gray, vuggy (possible small washouts) soft, friable, disseminated pyrite crystals.
471.9'	472.5'	Shale, greenish gray to green, banded light brown with thin lenses of dolomite.
472.5'	473.0'	Interbedded shale and claystone, as above.
473.0'	474.3'	Shale, steel gray to dark gray, with greenish tint, varved.
474.3'	475.6'	Claystone, greenish gray, disseminated pyrite crystals, vuggy (possible from being washed out); banded with some thin shale units, as above.
475.6'	478.6'	Mudstone, light brown to gray, soft, friable, badly broken; some thin brown shale interbedded.

From	To	Description
478.6'	480.4'	Shale, gray at top part of unit, medium brown in lower 1' section, upper section slightly varved, lower section slickensides, disseminated pyrite.
Core #25	From 480.4' to 509.3'	Cored 28.9' Recovered 27.7'
480.4'	482.6'	Shale, brownish to greenish gray; some banded medium brown with thin beds of oil shale; disseminated pyrite crystals and thin pyrite lenses; some slickensides; some interbedded mudstones, <u>vuggy</u> .
482.6'	484.6'	Oil shale and shales as above; mudstone bed 5" at 483.7'.
484.6'	489.6'	Mudstone interbedded with shale, some oil shale, high angle fractures; oil shale greenish brown, varved; shale green to gray with disseminated pyrite; mudstone gray, <u>vuggy</u> .
489.6'	490.9'	Oil shale, greenish dark brown, varved and brown, argillaceous, irregular bedding near bottom, slump features, <u>vuggy</u> .
490.9'	492.0'	Shale, reddish brown, slickensides, <u>vuggy</u> ; oil shale, bed dark brown, varved medium brown, solution cavities, 491.1' - 491.3'; some lenses of dolomite.
492.0'	495.0'	Mudstone, light brown to light gray, badly broken in places, more shaly toward bottom; some shale beds in upper unit.
495.0'	497.6'	<u>Breccia</u> , slump, composed of mudstone matrix, fragments of shale and oil shale, reworked.
497.6'	499.7'	Oil shale, varved dark brown to green, <u>vuggy</u> where segregated calcite crystals have been partially dissolved.
499.7'	500.0'	<u>Breccia</u> , composed of oil shale and shale, green to dark brown, apparent slumping.
500.0'	500.2'	Oil shale, as above.
500.2'	500.8'	<u>Breccia</u> , mudstone matrix, oil shale and shale fragments, slump structure.
500.8'	505.2'	Mudstone, light gray, non-descript; <u>breccia</u> as above from 502.7' - 503.7'; 1/8" shale band at 504.25'.
505.2'	508.1'	Shale, dark gray, slightly varved, <u>solution</u>

From	To	Description
		cavities, badly fractured; 1" lenses of tuff at 505.5' and 505.6', some thin dolomite lenses; some slickensides.
508.1'	509.3'	Missing.
Core #26	From 509.3' to 527.0'	Cored 17.7' Recovered 13.1'
509.3'	509.8'	Shale, gray, very slight varving, slickensides on fracture surface.
509.8'	510.7'	Breccia, composed of brown to dark gray shale fragments with mudstone matrix, some analcitized tuff, some banding of gray shale.
510.7'	512.3'	Mudstone, gray, friable, fractured, some zones of breccia, slump features.
512.3'	514.35'	Shale, gray to dark gray, some varving, medium brown, banding of medium brown oil shale; large solution cavities 2" wide at 513.3'; 2 to 3" wide at 513.8'; lined with residual clay blades; lenses of analcitized tuff 1" thick at 512.15', 1/2" thick at 512.3', 1/2" thick at 512.5' and 512.55' and 512.7'.
514.25'	518.75'	Oil shale, varved dark brown to medium brown, banded medium brown; some very thin analcitized tuff lenses.
518.75'	519.2'	Marlstone, medium brown, very slight varving.
519.2'	519.7'	Claystone, light brown, vuggy, with numerous lenses of dolomite crystals up to 1/2 to 1" thick.
519.7'	521.2'	Shale, light gray, banded with dark gray shale beds 1" thick at 520.45', 1/4" thick at 520.6', 1" thick at 520.8', 1/4" thick at 521.0'; banded with thin light brown to buff claystone.
521.2'	522.4'	Shale, light gray to gray, dense; disseminated pyrite crystals, thin clay bed 1" thick at 522.2'.
522.4'	527.0'	Missing.
Core #27	From 527.0' to 547.0'	Cored 20.0' Recovered 16.7'
527.0'	529.4'	Shale, brown to gray brown, vuggy (small solution) cavities, slickensides with soapy surface; interbedded claystone medium brown, soft.

From	To	Description
529.4'	531.6'	Dolomite, varved medium brown to dark brown, thin lenses of buff dolomite; numerous very thin blebs of analcitized tuff less than 1/8" thick.
531.6'	533.9'	Oil shale, varved dark to medium brown, dolomitic; high angle fractures, with slickensides; numerous very thin blebs of analcitized tuff less than 1/2" thick; large solution cavity at 533.65' - 533.9'.
533.9'	535.4'	Dolomite, medium brown, highly fractured, with <u>large solution cavities</u> ; tuff bed 1" thick at 534.4'; 1" thick at 535.05'.
535.4'	535.7'	Tuff, partially altered with rusty tint, section has appearance of rotting wood.
535.7'	538.3'	Claystone, light brown, varved appearance from shale and very thin analcitized tuff lenses with speckled appearance; high angle fractures; lower portion slumped and reworked from 536.7' - 537.2'; fracture infilled with pyrite.
538.3'	541.4'	Claystone, brown, numerous <u>vuggy large solution cavities</u> (appears as rotting wood); disseminated pyrite, and some blebs of pyrite.
541.4'	543.7'	Dolomite, medium reddish brown, slightly varved, argillaceous; blebs of analcitized tuff; <u>large solution cavity 2" thick</u> at 542.8', residual clay blade structures around cavity.
543.7'	547.0'	Missing.
Core #28	From 547.0' to 558.3'	Cored 11.3' Recovered 11.3'
547.0'	558.3'	Oil shale, dolomitic brown, gray to light brown, gray with reddish tint, argillaceous, highly fractured, numerous slickensides with bluish white soapy clay on surface; thin lenses of tuff analcitized 1/4" thick at 552.7', 553.85' disseminated pyrite crystals throughout section; <u>solution cavities</u> , 1.5" thick at 547.9', 4" thick at 548.9', 2" thick at 549.7', 1" thick at 551.05', 5" thick at 552.4', 1" thick at 554.9', 2" thick at 557.0', all with residual clay blade structures.

From	To	Description
Core #29	From 558.3' to 582.4'	Cored 24.1' Recovered 17.2'
558.3'	565.2'	Oil shale, medium brown, dull lustre, dolomitic, small blebs of light brown tuff and blebs resembling gilsonite. Unit is remarkably of uniform lithology. White earthy material on fracture surfaces.
565.2'	565.5'	Oil shale, medium brown, unit is badly broken and fractured. Oil shale has dull appearance with white earthy material on fractures.
565.5'	566.0'	Oil shale, varved, dark green brown to medium brown, white earthy material on bedding planes.
566.0'	569.2'	Mudstone, medium brown, slightly kerogenetic, with pyrite and black tuffaceous marbeling, white earthy material present on fracture surfaces, vugs are common with a solution cavity at 568.5'.
569.2'	572.7'	Oil shale, medium brown, dull earthy appearance, blebs of tuff and solution cavities containing residual clay blades from solution of possible nahcolite crystals. Large solution cavities at 571.3', 572.3', with small cavities located at 570.0' and 570.2'.
572.7'	574.4'	Oil shale, varved medium greenish brown to medium brown, lensing of varves, with white earthy material on fracture surfaces. Solution cavity with pyrite lining located at 574.3'.
574.4'	575.5'	Oil shale, medium brown, badly broken and fractured with evidence of large solution cavities. Most of this unit was probably washed out. White earthy material present on fracture surfaces.
575.5'	575.7'	Oil shale varved, dark brown to medium brown, with some slump structure.
575.7'	582.4'	Missing.
Core #30	From 582.4' to 603.8'	Cored 21.4' Recovered 16.1'
582.4'	582.7'	Oil shale, medium brown, bedding irregular to slumped, badly broken and fractured, evidence of <u>large solution cavities</u> .

From	To	Description
582.7'	585.0'	Mudstone, medium brown, interbedded with brown siltstone. Siltstone is slightly varved. Mudstone areas have pyrite streak and MnO ₂ deposits along bedding planes, white earthy material is present along fractures and bedding planes, white earthy material is present along fractures and bedding planes.
585.0'	591.0'	Oil shale, medium brown, dull earthy lustre, some varves and blebs of tuff (light brown). Solution cavities and vugs are common with some of the cavities lined with white and brown bladed clays. Thin bedded tuffs located at 585.9', 586.75', 588.0'.
591.0'	591.4'	Mudstone, medium brown, badly fractured and broken.
591.4'	593.0'	Mudstone, medium brown, irregular bedded, MnO ₂ deposits along bedding planes. White clay-like material along bedding planes and fractures, lower part of unit is badly fractured.
593.0'	597.4'	Oil shale, medium brown, blebs of tuff and claystone (light brown) throughout unit. Solution cavities with residual bladed clay linings common, nodules of pyrite 1/8 to 1/4" in thickness common in lower portion of unit, intraclase of claystone at 597.1'.
597.4'	603.8'	Missing.
Core #31	From 603.8' to 640.4'	Cored 36.6' Recovered 28.9'
603.8'	605.0'	Oil shale, dark brown, dull waxy lustre, blebs of light brown claystone and tuff, unit is badly fractured and broken white earthy material on fracture surfaces.
605.0'	610.5'	Marlstone, light brown, slightly varved, interbedded with lean oil shale, varved medium green to light brown, some lensing of varves.
610.5'	613.6'	Oil shale, dark brown, fracture surfaces covered with white earthy material, small blebs of black organic matter.
613.6'	615.5'	Marlstone, light brown slightly varved, some

From	To	Description
		solution along bedding plane.
615.5'	620.9'	Oil shale, dark brown, waxy dull lustre, blebs of tuff (medium brown) and very thin blebs of black organic matter, unit is fractured and has deformed bedding at 616.6', 620.0'.
620.9'	621.5'	Marlstone, gray brown slightly varved with solution cavities along bedding planes.
621.5'	632.6'	Oil shale, dark brown, waxy dull lustre, lighter blebs of tuff common, middle of unit has lower density and is very dark, (vicinity 624.0'), unit grades to varves toward bottom and is irregularly bedded.
632.6'	640.4'	Missing
Core #32	From 640.4' to 659.0'	Cored 18.6' Recovered 6.7'
640.4'	641.3'	Oil shale, dark brown, waxy dull lustre, <u>large solution cavity</u> with residual clay blades, unit slumped and fractured.
641.3'	641.9'	Marlstone, gray brown, badly broken and fractured.
641.9'	643.0'	Oil shale, dark brown, waxy dull lustre, small blebs of light brown tuff, evidence of <u>large cavity</u> at bottom of unit.
643.0'	644.2'	Dolomite, medium brown, slightly varved badly fractured and broken.
644.2'	646.6'	Oil shale, medium brown to dark brown, varved toward bottom of unit, solution cavities with residual bladed clay, lensing of varves at bottom of unit, suspect unit has been washed, possible nahcolite eroded away.
646.6'	647.1'	Claystone, gray brown, slightly varved to laminated, badly fractured and broken.
647.1'	659.0'	Missing
Core #33	From 659.0' to 669.5'	Cored 10.5' Recovered 6.2'
659.0'	661.4'	Oil shale, medium to medium dark brown, slight varving; <u>solution cavities with residual clay blade lining</u> ; some zones with small vugs, lower section badly broken.

From	To	Description
661.4'	665.2'	Oil shale, varved dark brown to green, banded to gray mudstone section usually 1" to 2" thick, 3" thick mudstone at 663.5'; 1/2" thick tuff lense at 662.7'; upper 6" section has irregular bedding, appears slumped; some slight irregular beds scattered over unit.
665.2'	669.5'	Missing core
Core #34	From 669.5' to 685.3'	Cored 15.8' Recovered 12.0'
669.5'	672.2'	Oil shale, varved dark brown to medium brown; thin blebs of analcitized tuff.
672.2'	673.5'	Mudstone, gray, some banding of thin oil shales, dark brown; highly fractured and badly broken in sections.
673.5'	677.0'	Oil shale, medium brown, slight varving, dolomite; numerous thin blebs of analcitized tuff, vuggy.
677.0'	679.9'	Oil shale, dark to medium brown, varved green, argillaceous; fractured and broken, white clay on fracture surfaces.
679.9'	681.5'	Oil shale, medium brown, slight varving, banded dark brown, dolomitic; upper section badly fractured and broken.
681.5'	685.3'	Missing core
Core #35	From 685.3' to 699.3'	Cored 14.0' Recovered 8.0'
685.3'	686.95'	Oil shale, medium brown, slight varving, banded with some thin buff claystone units, dolomitic; buff dolomite lense 1/2" thick at 686.2', thin lenses 1/8" thick at 685.7' of analcitized tuff.
686.95'	689.0'	Oil shale, varved dark brown to medium brown, banded buff with thin claystone lense; blebs of analcitized tuff.
689.0'	689.7'	Oil shale, medium brown, slightly varved, dolomitic; thin lenses of analcitized tuff.
689.7'	693.3'	Oil shale, varved dark brown to medium brown; thin blebs of analcitized tuff.
693.3'	699.3'	Missing core

From	To	Description
Core #36	From 699.3' to 719.3'	Cored 20' Recovered 9.4'
699.3'	700.75'	Oil shale, varved dark medium brown to dark brown; thin blebs of dolomite, buff; thin blebs of analcitized tuff, large solution cavities with residual clay blade structures (possible nahcolite zone which has been dissolved).
700.75'	704.6'	Oil shale, medium brown, slightly varved, marly; a mass of vugs and larger solution cavities, residual clay blade structures lining most cavities (no nahcolite detected, however suspected); badly broken; small occasional blebs of buff clay.
704.6'	706.4'	Oil shale, medium dark brown slightly varved; thin blebs of dolomite buff, thin lenses analcitized tuff; one large solution cavity 3" across at 705.2', with residual clay blade structures.
706.4'	708.7'	Oil shale, medium dark brown, varved, banded light brown with thin claystone beds; zones of interbedded tuff 1" thick at 706.95', 1" thick at 707.2', 1" thick at 707.5'; disseminated flakes of white clay from 707.7' to bottom; some vugs in upper section; numerous thin blebs of analcitized tuff.
708.7'	719.3'	Missing core
Core #37	From 719.3' to 749.1'	Cored 29.8' Recovered 27.9'
719.3'	725.2'	Oil shale, medium brown varved, interbedded with thin marlstone, light brown to medium green. Oil shale is dolomitic. Solution cavities 723', filled with fine blade clay.
725.2'	727.6'	Oil shale, medium brown, dull waxy lustre, blebs of light brown tuff common with lensing of irregular thin bedded layers of dark brown to black organic material (darker oil shale), layer of tuffaceous oil shale at 227.5' - 227.6'.
727.6'	730.0'	Oil shale, varved dark green brown to dark brown, lensing of varves causing "eye-like" structure.

From	To	Description
730.0'	740.8'	Oil shale, medium brown, dull waxy lustre, tuff irregularly bedded with local deformation of the oil shale existing at the top of the unit; rest of unit has occasional interbedding of irregular bedded tuffs, lensing of darker organic material (darker oil shale) which is irregularly bedded and causes marbeling effect. Blebs of light brown tuff, and some analcitized tuffs, very local calcite vugs and veinlets. Over all unit is dolomitic, slump (enterolithic) structures, blebs of gilsonite locally.
740.8'	747.2'	Oil shale, varved dark green brown to medium brown to dark brown, marly near top of unit, dolomitic below 743.3', bleb of analcitized tuff at 744.8', lensing of varves creates "eye-like" structure; <u>solution cavities</u> (small) at 745.1', calcite along bedding planes and along some fractures. Dolomite crystals on bedding plane at 741.0', planer rhomb crystals on some bedding surfaces at 742.7', 743.3'.
747.2'	749.1'	Missing core
Core #38	From 749.1' to 779.1'	Cored 30.0' Recovered 30.5', 0.5' recovered from previous core.
749.1'	752.6'	Oil shale, varved dark brown to medium brown, lensing of varves causes "eye-like" structure. <u>Solution cavity at 752.3'</u> , probably contained nahcolite, blebs of light brown tuff or claystone occur in the locality of the solution cavity.
752.6'	754.3'	Marlstone, brown, unit has <u>small vugs and solution cavities</u> , some of the <u>small vugs</u> have white clay filling.
754.3'	757.3'	Oil shale, medium brown, dull waxy lustre, <u>solution cavities</u> , probably contained nahcolite. Blebs of light brown claystone or tuff and larger blebs of analcitized tuff scattered along unit, unit is dolomitic, analcitized tuffs have <u>small vugs</u> and solution cavities, bladed residual clays line solution cavities.
757.3'	762.9'	Oil shale, varved dark green brown to medium brown, slump and enterolithic structure located at 760.3', some banding caused by thin bedded

From	To	Description
		marlstone and claystone (light brown), pyrite mineralization at 757.8', 758.2'.
762.9'	767.1'	Oil shale, medium brown, waxy dull lustre, with small blebs of claystone and tuff abundant, some fine black streaks within unit. Analcitized tuffs rarely, <u>fossil leaf imprint</u> at 762.1'.
767.1'	767.9'	Claystone, light brown, varved, unit is broken with large solution cavities, cavities lined with black fine grained material.
767.9'	772.3'	Oil shale, medium brown, dull waxy lustre, <u>large solution cavities</u> with residual bladed clays common near top and bottom of unit, pyrite also found living cavities, blebs of light brown tuff or claystone numerous.
772.3'	773.9'	Oil shale, medium brown, interbedded with light brown claystone, causing banding, slump structure at 773.3' with pyrite located along deformed bedding planes.
773.9'	779.1'	Oil shale, medium brown, dull waxy lustre, blebs of light brown claystone and/or tuff numerous, pyrite mineralize at 777.4' and 779.0'.
Core #39	From 779.1' to 809.1'	Cored 30.0' Recovered 29.7'
779.1'	780.8'	Oil shale, medium brown, dull waxy lustre, blebs of claystone, light brown. Analcitized tuff at 780.8'.
780.8'	783.1'	Oil shale, varved dark brown to medium brown, lensing of varves causes "eye like" structure, some irregular bedding near bottom of unit.
783.1'	793.7'	Oil shale, medium brown, waxy dull lustre, grading to oil shale, varved, dark green brown to dark brown, upper portion has blebs of brown tuff and claystone, with slight solution around some tuff blebs. The lower portion is characterized by lensing of the varves and then grades back to the blebby dull lustre oil shale.
793.7'	796.7'	Oil shale, varved medium green brown to light brown, interbedded with light brown claystone, causing banding, pyrite replacement along rare irregular bedding planes.
796.7'	808.7'	Oil shale, varved medium green brown to medium brown, dolomitic, unit is surprisingly homogeneous, slight pyrite mineralization at 804.8' and 807.5', thin tuff beds at 807.1' and 807.4'.

From	To	Description
808.7'	809.1'	Missing
Core #40	From 809.1' to 839.1'	Cored 30.0' Recovered 30.0'
809.1'	813.0'	Oil shale, varved brown, interbedded and banded with light brown marlstone, occasional thin bedded siltstone, and blebs of black organic material.
813.0'	828.5'	Oil shale, varved brown (lean), interbedded with sandstone and claystone, blebs of tuff are surrounded by pyrite mineralization and locally are vuggy, unit is dolomitic.
828.5'	839.1'	Marlstone (lean oil shale), medium brown, badly broken and fractured, unit is vuggy with large solution cavities, cavities are lined with residual bladed clays and some carbonate, possibly nahcolite. Analcitized tuffs are located at major zones of breakage.
Core #41	From 839.1' to 859.7'	Cored 20.6' Recovered 14.4'
839.1'	846.9'	Marlstone, medium brown, badly broken in sections, fractured, vuggy with large solution cavities, residual clay blade structure evident in some cavities, numerous lenses of analcitized tuff; scattered blebs of tuff.
846.9'	849.7'	Oil shale, varved medium to dark brown, dolomitic, some banding of light brown to buff claystone 1" thick at 848.05'; vuggy with large solution cavities, lined with residual clay blade structure, on the surface of blade structure is gray material; some thin tuff lenses are analcitized.
849.7'	853.5'	Oil shale, varved medium brown to greenish brown, marly; several large solution cavities with residual clay blade structures; thin tuff lenses are analcitized, irregular bedding around the cavities.
853.5'	859.7'	Missing core
Core #42	From 859.7' to 877.9'	Cored 18.2' Recovered 15.7'
859.7'	875.4'	Oil shale, medium to light brown, slightly varved, marly, (lean oil shale), thin blebs of buff claystone with local vugs; large solution cavities, with residual clay blade

From	To	Description
875.4'	877.9'	structures, sections of badly broken material; thin blebs of tuff scattered throughout. Missing core
Core #43	From 877.9' to 883.0'	Cored 5.1' Recovered 5.1'
877.9'	883.0'	Marlstone, light brown to buff, slightly varved in some sections, (possibly lean oil shale); numerous large solution cavities with some residual clay blade structures, badly broken (solution cavities possibly where nahcolite dissolved).
Core #44	From 883.0' to 913.7'	Cored 30.7' Recovered 30'
883.0'	889.3'	Oil shale, varved light to medium brown, marly, banded light brown in more marly zones, large solution cavities with residual clay blade structures, irregular bedding around cavities; some thin blebs of tuff.
889.3'	893.3'	Oil shale, varved dark brown to medium dark brown with greenish tint, banded medium brown from 889.3' to 889.8'; marly; thin blebs approximately 1/16" thick of black organic appearing material in the section from 890.0' to 891.2', some thin blebs of tuff.
893.3'	895.8'	Oil shale, varved medium brown to green, banded light to buff probably high clay content; marly; large solution cavities, with some residual clay blade structures; irregular bedding around cavities, some truncated varves; scattered blebs of tuff.
895.8'	898.5'	Oil shale, varved medium brown to dark brown and green, slightly marly, banded with light brown zones; irregular bedding, some truncated varves; thick lenses of tuff 1/8" thick at 898.1', and 898.4'; fracture in fills of pyrite at 898.0'.
898.5'	905.4'	Oil shale, varved dark brown to green, banded light to medium brown, also banded zones of irregular bedding and zones of numerous tuff blebs, scattered medium to large blebs, 1/8" to 1/2" thick; zones of pyrite and possible analcitized tuff in fill in fractures around slump features at 899.0' and 900.0'.
905.4'	906.6'	Oil shale, varved green to medium brown, banded light brown in zones of high clay content; some thin blebs of tuff; bedding plane in fill.

From	To	Description
906.6'	913.0'	of pyrite. Oil shale, dark brown to greenish medium brown, marly, banded light brown in zones of higher clay content; very numerous very thin lenses of black, lenses possible zones of higher organic content or fossil material, in the upper section of unit 906.6' - 910.1'.
913.0'	913.7'	Missing core
Core #45	From 913.7' to 943.1'	Cored 29.4' Recovered 29.9', 0.5' recovered from previous core
913.7'	916.8'	Oil shale, varved dark olive green to brown, dolomitic, clean with very thin rare light brown tuffs.
916.8'	922.7'	Oil shale, varved medium brown to medium green brown, thin light brown tuff beds throughout unit causing banding, dolomitic, lensing of varves are noted near top of unit; unit grades to brownish gray in color toward bottom of unit.
922.7'	937.4'	Oil shale, varved dark brown to medium brown, occasional rare thin bedded tuffs and claystones, pyrite mineralization (dendritic) from 928.5' to 930.0', pyrite blebs from 935.0' to 936.3'.
937.4'	943.1'	Oil shale, light brown to medium brown, dolomitic to marly, irregular bedding throughout unit with some pyrite deposition on irregular bedding surfaces, thin irregular bedded tuffs and claystones are rare.
Core #46	From 943.1' to 973.7'	Cored 30.6' Recovered 30.0'
943.1'	947.3'	Oil shale, dark to medium brown, band light brown to buff in zones of higher clay content, marly; analcitized tuff lenses 1/4" thick at 944.25'; zones of irregular lenses of analcitized tuff at 946.6', 947.1' and 947.3'.
947.3'	950.0'	Oil shale, varved medium brown to medium dark brown, lensing varves, banded light brown, dolomitic, with light brown zones more marly; upper section from 947.3' - 948.55' numerous thin blebs of tuff; lower section from 949.0' to 950.0', some irregular bedding with slumping; zone of irregular lenses of analcitized tuff from 949.5' - 949.8'.

From	To	Description
950.0'	952.15'	Oil shale, varved light to medium brown with greenish gray tint, to darker brown, banded light brown, marly; irregular bedding in several places appears slumped; some thin blebs of tuff.)
952.15'	955.25'	Oil shale, dark brown to green, slightly varved, marly, one band light brown at 953.65'; numerous thin blebs of tuff; zone of pyrite 1.5" thick at 954.35'.
955.25'	956.15'	Oil shale, varved medium brown to green gray, dolomite, banded green gray to light brown; some varves of medium brown with sugary texture.
956.15'	959.8'	Oil shale, medium to dark brown, irregular varves (thick to thin), dolomitic, numerous blebs of claystone and tuff; several lenses of thin brown to black organic appearing material; thin black lense at 958.85' possible plant fragment.
959.8'	962.7'	Oil shale, varved medium brown to green gray to dark brown, banded green to light brown; zones of numerous analcitized tuff lenses 1.5" thick at 959.8', 1.5" thick at 960.45'; bedding plane parallel to bore hole axis, numerous dark brown varves of apparent richer oil shale.
962.7'	966.9'	Oil shale, medium dark brown, less distinct varving, numerous varves darker brown oil shale; some lenses of analcitized tuff.
966.9'	973.7'	Oil shale, varved medium brown to greenish brown to dark brown in zones, dolomitic, banded light brown with thick section greenish brown from 967.9' - 970.2'; thin varves of dark brown oil shale scattered throughout the section; irregular bedded rework zones 2" thick at 966.8' and 2.25" thick at 970.0'; thin lenses of analcitized tuff and pyrite at 967.2' - 967.4'; blebs of tuff 1/4" thick at 970.95', 3/4" thick at 970.9'.
Core #47	From 973.7' to 1003.1'	Cored 29.8' Recovered 29.8'
973.7'	980.0'	Oil shale, varved dark brown to medium brown, banded with light brown zones of possibly higher clay content; dolomitic, some irregular varving with eye-like structures; zones of dark gray brown oil shale with poker chip fractures from 976.3' to 976.9' and 977.6' to

From	To	Description
980.0'	987.6'	978.9', waxy lustre with some slickensides. Oil shale, varved dark brown to medium brown, varves of more argillaceous oil shale with some slickensides, some thin lenses of tuff from 980.0' - 982.0', a fossil plant fragment at 984.8'.
987.6'	991.4'	Oil shale, varved dark brown to medium brown, banded light brown, very slightly dolomitic; numerous thin blebs of tuff; numerous very small blebs, dark brown, of organic material.
991.4'	995.0'	Oil shale, dark brown, varved, some banding light brown, argillaceous, thin varves of very argillaceous material with slickensides; some thin discus type fracturing; numerous lenses of tuff 1/8" to 1/4" thick, thin blebs of more organic material.
995.0'	999.6'	Oil shale, varved dark brown to medium brown, some banding light brown in the lower 4" of section, upper section argillaceous; slightly marly, lower 1' more marly; some thin lenses of tuff; fossil fragment at 997.95', possible fish spine.
999.6'	1003.1'	Oil shale, medium to light brown, varved; marly, very irregular bedding, slumped, appears twisted and whirled with light brown and medium brown mixed; some blebs of tuff.
Core #48	From 1003.1' to 1033.7'	Cored 30.6' Recovered 30.6'
1003.1'	1004.35'	Oil shale, varved medium to light brown, marly; interbedded claystone, light brown; irregular bedding, slump features; blebs of tuff.
1004.35'	1005.4'	Oil shale, varved dark brown to medium brown, argillaceous, banded light brown.
1005.4'	1019.2'	Shale, gray to brown gray, interbedded with dark brown oil shale; poker chip fractures, also discus fractures, badly broken (blue marker); some fossil fragments, most plant material; increase in interbedded oil shale below 1008.0'.
1019.2'	1022.7'	Oil shale, dark brown, varved, argillaceous; interbedded claystone, gray, oil shale is marly; numerous fossil fish partly or completely pyritized, example 1019.7'; also fossil wood partly pyritized at 1021.3', numerous other fossils.
1022.7'	1023.95'	Siltstone, gray, with some fossil fragments,

From	To	Description
		some interbedded oil shale, dark brown to medium brown.
1023.95'	1033.3'	Oil shale, dark brown, varved, argillaceous; interbedded claystone, blue gray, a few fossil fish pyritized, discus fractures usually along smooth argillaceous surfaces.
1033.3'	1033.7'	Siltstone, gray to blue gray.
Core #49	From 1033.7' to 1064.1'	Cored 30.4' Recovered 29.5'
1033.7'	1034.5'	Siltstone, gray to blue gray, massive.
1034.5'	1050.8'	Oil shale, varved, brown, argillaceous, hacky fracture, interbedded with dark gray to dark brown shale characterized by discing. Very thin layers of calcite exist toward bottom of unit, fossil fragments are common.
1050.8'	1063.2'	Oil shale, varved dark brown to medium brown, unit calcaceous, hacky fracture, with calcite layers (very thin), common, occasional blebs of tuff, unit has strong characteristic oil shale odor, with a tendency to disc (poker chip like).
1063.2'	1064.1'	Missing.
Core #50	From 1064.1' to 1094.1'	Cored 30.0' Recovered 29.3'
1064.1'	1093.4'	Oil shale, varved brown, interbedded with gray brown shale, marlstone and light brown very fine grained sandstone, unit discing and fractures easily, every fine grained sandstone located at 1066.5', 1069.9', 1071.2', thin layers of calcite are common, fossil wood fragments on bedding planes common, dolomite layers, very thin at 1078.0', analcitized tuffs at 1078.6', 1080.4', 1084.0', 1085.0'. Gray siltstone 0.5' thick located at 1086.3', slump structures and irregular bedding around tuffs at 1085.0'.
1093.4'	1094.1'	Missing.
Core #51	From 1094.1' to 1123.1'	Cored 29.0' Recovered 31.6' (mylonite zone possibly swelled to twice its size)
1094.1'	1104.0'	Oil shale, siltstone, shale, interbedded, from green brown to dark brown to gray in color. Unit is badly broken and fractured. Unit is characterized by its tendency to disc (poker

From	To	Description
1104.0'	1105.0'	chip), pyrite streaks common. Clay, dark brown, oil shale odor, bentonite?, Montmorillonite?, illite? Zone may be mylonite, along fault plane. (Clay plugged core barrel had to be removed with ramrod, clay then expanded 1.5 times size at core.)
1105.0'	1121.0'	Oil shale (lean), varved medium brown to dark brown, interbedded with light brown marlstone, analcitized tuffs at 1106.8', 1109.0', 1115.0', 1115.6', 1120.1', 1120.7', unit is broken (poker chips) at 1117.5'.
1121.0'	1123.1'	Siltstone, light gray, massive
Core #52	From 1123.1' to 1153.4'	Cored 30.3' Recovered 30.3'
1123.1'	1127.2'	Oil shale, dark brown, varved, interbedded shale, gray, and claystone green gray; more shale section from 1126.25' - 1127.0' is badly broken discus type fracture; evidence of vertical fracture with a vertical infill of claystone, with some oil shale fragments in the claystone from 1123.4' - 1123.7'; zones of thin tuff interbedding between 1124.25' and 1124.8'.
1127.2'	1127.8'	Siltstone, blue gray, lenses of dark brown material possibly a fossil at 1127.3', good oily odor.
1127.8'	1136.1'	Oil shale, dark brown, varved; interbedded shale, gray, both locally and in zones of shale are most badly broken into discus shape; some interbedded claystone, green gray, with some very small black flakes scattered throughout; some lensing of claystone in the oil shale appears as possible depression infill during deposition, scattered tuff blebs; overall discus fracturing.
1136.1'	1153.4'	Oil shale, dark brown, varved; thin interbedding of shale, gray and claystone, blue gray; discus fractures usually along thin shale bedding planes; also zones of shale which are badly broken; claystone bed from 1142.0' - 1144.0' with some thin oil shale beds and numerous oil shale fragments, also some very small blebs of possible organic material; numerous lenses of tuff in upper section 1136.5' - 1136.7', 1139.0' - 1139.2', 1142.0' - 1142.1', also some tuff and light brown claystone lenses in lower section 1151.85' -

From	To	Description
		1152.0', 1152.2' - 1152.4'. In the overall section of oil shale numerous nodules (probably coprolites) appear on core surface as knot-holes and can be removed usually intact.
Core #53	From 1153.4' to 1183.1'	Cored 29.8' Recovered 29.8'
1153.4'	1153.9'	Oil shale, dark brown, varved; thin interbedded claystone, light brown; numerous small fossil fragments, mostly plants.
1153.9'	1159.6'	Claystone, blue gray, massive, numerous small fossil fragments, appear to be mostly plant material, parts of leaves and stems; becomes more of a siltstone in bottom 1'; many fracture surfaces have streaks of tar-like material.
1159.6'	1166.7'	Oil shale, dark brown, varved, argillaceous; interbedded shale, gray; section badly fractured, fracture surfaces with streaks of tar-like material; numerous nodules, dark brown, similar to knot holes (probably coprolites), oil shale varving is convoluted around nodules; numerous fossil fish fragments.
1166.7'	1183.1'	Oil shale, dark brown, varved, argillaceous; interbedded shale, gray, interbedded zones and thin interbedding with the oil shale; entire section badly fractured, in discus form; thin tar-like residue on fracture surfaces from 1174.9' to 1177.2'; pyrite fracture infill 1180.0' to 1180.45', thin tuff lenses analcitized 1/4" at 1181.8', 1/2" to 3/4" at 1182.2', fractured both discus and high angle.
Core #54	From 1183.1' to 1210.1'	Cored 27.0' Recovered 26.5'
1183.1'	1209.95'	Oil shale, hacky fracture, varved dark brown, interbedded with gray brown shale, blebs of tuffaceous type material, some dolomite blebs, also large bleb of pyritized material at 1193.7', coprolite 1/4" in diameter at 1207.7', siltstone dike (joint filling) from 1203' to 1205.1' (Orange Marker 1190' - 1215').
1209.95'	1210.1'	Missing.

From	To	Description
Core #55	From 1210.1' to 1222.7'	Cored 12.6' Recovered 8.8'
1210.1'	1218.9'	Shale, medium gray, interbedded with medium bedded light brown siltstone, clay mass, may be mylonite zones, common.
1218.9'	1222.7'	Missing.

END OF CORE