

LITHOLOGIC DESCRIPTIONS

GETTY OIL CO. #31
SW $\frac{1}{4}$, NW $\frac{1}{4}$, SEC 29, T5S, R97W, GARFIELD COUNTY, COLORADO

CUTTING DESCRIPTION

- 0 - 12.0 Light gray marlstone and yellowish to yellow brown sandstone, equal percentages.
- 12.0 - 105.6 Lost circulation - drilling appears to be sandstone with thin (0.1 - 0.3 ft.) marlstone zones; core attempt at 63 ft. recovered yellowish brown, soft, very porous, sandstone; resumed rotary to 105.6.

CORE DESCRIPTION

- 105.6 - 118.4 Marlstone - light gray to medium gray and light brownish gray; HCl - yes; chalky luster; laminated with common distorted bedding; medium to dark gray, sandy tuffs with common pyrite at 106.6, 107.25, 108.5, 109.0 - 109.3, 109.35 - 109.6, and 109.7 - 109.9, bedding distorted above and below zones with slump or flowage feature at 107.05; resistant tuffs at 114.2 and 115.2; some interbedded silts 117.0 to bottom.
- 118.4 - 134.4 Siltstone and sandstone - light to medium gray; HCl - yes; chalky luster; massive to banded with rare marlstone laminations; tuff with pyrite at 119.9; irregular gray tuff with minor solution at 120.9; soft tuff at 131.0; broken and jumbled 132.4 - 134.0; dark gray sandstone with tuff and common pyrite 134.0 - 134.4.

- 134.4 - 144.15 Marlstone and siltstone - light gray to light brownish gray; HCl - yes; earthy to chalky luster; laminated to varved with brownish marlstone laminae separated by gray silty layers with common dead oil, highly distorted bedding 138.0 - 138.5; gray tuff at 139.5; tuff stringer at 142.1 with common pyrite.
- 144.15- 147.7 Marlstone with some oil shale - light brownish gray with some medium and dark brownish gray; HCl - yes; earthy luster; laminated with common distorted bedding, some loop structures; bedding highly distorted 144.6 - 145.0.
- 147.7 - 148.8 Sandstone - medium to dark gray; HCl - yes; chalky luster; massive; analcitized tuff at top; pieces of marlstone from 148.2 to bottom; some tuff stringers and common gilsonite throughout.
- 148.8 - 151.5 Oil shale and marlstone - light to medium brownish gray; HCl - yes; earthy luster; laminated with common distorted bedding, some loop structures and rare streaked bedding; interbedded tuffs causing slumpage to 149.0; some tuff streaks and stringers throughout.
- 151.5 - 157.4 Marlstone - light to medium brownish gray; HCl - yes; earthy luster; laminated with some streaked bedding; some tuff streaks and stringers throughout.
- 157.4 - 159.4 Marlstone and oil shale - light, medium and dark brownish gray; HCl - yes; earthy luster; laminated with rare loop structures; tuff at top of interval; irregular light gray tuff at 158.2; buff, analcitized tuff with oil shale laminae 158.7 - 158.9; dark oil shale immediately above and below tuff.
- 159.4 - 174.5 Mudstone - light gray and buff to light brownish gray; HCl - no to minor; earthy luster; laminated with rare streaked bedding, rare kerogen-rich laminae; fractured at 162.0, 165.4 and 167.4; gray tuff at 171.1; two fractures (0°) from 171.2 - 172.5; some tuff stringers throughout.
- 174.5 - 178.25 Mudstone - light gray to light greenish gray; HCl - no to minor; chalky luster;

massive; interbedded tuffs with some pitting 175.3 - 175.7; zones of tuff stringers at 176.3, 176.35, 176.45 and 176.75; tuffs at 177.35, 177.45 and 177.75.

178.25- 186.5

Marlstone with some oil shale - light to medium brownish gray with rare dark brownish gray; HCl - yes; earthy luster; laminated with rare loop structures and distorted bedding; irregular tuff at 180.35; tuff with common pyrite blebs and stringers 182.1 - 182.5; fractured and jumbled to 184.0; common tuff streaks and stringers throughout.

186.5 - 189.85

Mudstone - light gray to light and medium brownish gray; HCl - no to minor; chalky to earthy luster; laminated with common distorted bedding; common rust staining throughout, associated with pyritic concentrations; interbedded tuff at 186.9 - 187.0; thin tuff at 187.55; tuffs and fractures with oil staining 188.3 - 188.5; fractured with rust and oil staining 189.5 to bottom.

189.85- 193.4

Marlstone with some siltstone - light gray to light brownish gray; HCl - yes; chalky luster; laminated with common distorted bedding; bedding highly distorted by tuff blebs at 190.5; fractured with calcareous coating at 191.4.

193.4 - 203.7

Marlstone and oil shale - light to medium brownish gray with rare dark brownish gray; HCl - yes; earthy luster; laminated with some distorted, rare streaked bedding; buff colored, analcitized tuff with oil shale laminae 194.0 - 194.25, dark zones above and below tuff; rare tuff streaks and stringers throughout.

203.7 - 209.95

Marlstone with rare oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with some distorted bedding; moderate distortion around zones of interbedded tuffs at 206.8 and 208.4; minor interbedding of tuffs 209.0 to bottom.

209.95- 235.5

Sandstone - light to medium gray; HCl - yes; chalky luster; massive with rare marlstone lamination; very soft and

porous rock; streaks of dead oil throughout; fractured from top to 212.2 and from 213.0 - 214.3 with rust-stained fracture surface; fractured at 216.3; jumbling of core associated with fracture (?) 217.3 - 218.0; solution of core with vugs and associated pyrite from 224.0 to bottom; crystalline pyrite in vug at 224.2; fractured from 233.0 - 233.5, with solution cavity at bottom; solution zone with crystalline pyrite at 235.25.

- 235.5 - 245.9 Siltstone - light gray and medium brownish gray; HCl - yes; chalky luster; massive with common, highly distorted, laminae throughout; fractured at 238.9 and 242.2 - 245.6.
- 245.9 - 251.1 Mudstone - light gray to buff and light brownish gray; HCl - minor; earthy to chalky luster; massive with common highly distorted, silty laminations throughout; small solution vugs at 247.75; fractured at 250.1.
- 251.1 - 253.4 Sandstone - medium gray; HCl - minor; chalky luster; massive with some distorted, silty, laminae; common dead oil streaks throughout.
- 253.4 - 256.1 Mudstone - light to medium brownish gray; HCl - no; earthy luster; laminated with common distorted bedding; some kerogen-rich laminations; fractured 254.0 - 255.0 and 255.8 to bottom; zone of grayish sand 254.3 - 254.6; highly distorted silty laminations at 254.7.
- 256.1 - 266.2 Sandstone - medium gray; HCl - minor; chalky luster; massive with common, distorted silty laminae; fractured from top to 258.85, with some solution at 256.6; fractured 261.2 to bottom with oil stained fracture surfaces; jumbled at bottom.
- 266.2 - 274.0 Mudstone - light to medium brownish gray; HCl - minor; earthy luster; laminated with some distorted bedding; fractured from top to 266.8; tuff blebs at 268.0 and 268.35; zone of medium gray, massive sand at 270.25 - 271.8, fractured throughout with oil stained surfaces; fractured 273.1 to bottom with oil stained surfaces; fractured at 272.3.

274.0 - 337.05

Rotary drilled - no circulation - drilled like soft sand or silt with some marlstone stringers (about 0.3 ft.).

337.05- 342.1

Oil shale - light, medium and dark brownish gray; HCl - yes; earthy luster; rare, very faint laminations, common streaked and distorted bedding; tuff stringers at 338.65 and 338.75; tuff at 339.29 with some tuff blebs to 340.0; common tuff and crystalline calcite stringers with possible bedding plane fractures 340.0 to bottom; distorted bedding at bottom caused by tuff at 341.9; tuff zones at 340.95 and 341.2.

342.1 - 343.5

Siltstone - light brownish gray; HCl - yes; chalky luster; massive with rare distorted laminations; fractured to 343.0 with massive pyrite filling; fractured 343.0 to bottom.

343.5 - 349.6

Oil shale - light, medium and dark brownish gray; HCl - yes; earthy luster; laminated with rare loop structures, common streaked and distorted bedding; tight fracture traces to 346.0, with minor fracturing 346.0 - 346.25; fractured 347.0 - 348.8 with calcareous filling; interbedded tuffs 348.4 - 348.5; tuff bleb with some pitting 349.3, upper and lower bedding distortion.

349.6 - 356.5

Oil shale - medium to dark brownish gray and medium greenish brown with rare light brownish gray; HCl - yes; earthy luster; faintly laminated with common streaked and some distorted bedding; small fracture at 350.4; interbedded tuffs distorting bedding 351.0 - 351.6 and 353.6 - 354.2; tuff distorting bedding at 354.6; fractured 354.6 - 355.0; 355.25 - 355.65 shattered and recemented with calcite and gilsonite; tuff at 356.15.

356.5 - 364.1

Oil shale - medium to dark brownish gray and medium greenish brown; HCl - yes; earthy luster; laminated with common streaked and distorted bedding; interbedded tuffs with gilsonite and calcite 356.5 - 356.8; fractured from top to 360.4 with heavy gilsonite coating; 360.0 - 360.5 contains nearly solid gilsonite; interbedded tuffs 361.35 - 361.7; fractured from 362.0 into shattered

and recemented zone at 362.7; 363.1 to bottom contains soft tuffs, silts and some oil shale that contains common calcite and gilsonite, appears recemented, moderate solution throughout zone. Correlation Line with #33 (?).

364.1 - 369.5

Oil shale - light to medium brownish gray with some dark brownish gray; HCl - yes; earthy luster; laminated to faintly laminated with common streaked bedding; fractured at top to 365.0 with calcareous coating; tuff zones 365.25 and 365.35; fracture trace 365.8; 3 tuff zones 368.0 - 368.15; fracture with oil coating 368.4 to 369.0; tuff zone at 368.9.

369.5 - 371.7

Sandstone and oil shale - medium gray to light and medium brownish gray; HCl - yes; chalky to earthy luster; laminated oil shale with interbedded sandstone; highly irregular bedding; tuff zones at top, 369.7, 370.95 and 371.05 to bottom; tuff with sandstone at bottom.

371.7 - 378.05

Oil shale - light, medium and dark brownish gray; HCl - no; earthy, with some satiny, rare vitreous luster; streaked bedding with some laminations, common distorted bedding; interbedded, oil stained tuffs 373.0 - 373.15 and 376.0 - 376.25, bedding distorted above and below both zones; bedding distorted below tuff at 376.3; fracture with oil coating at 376.4.

378.05 - 416.1

Sandstone - light to medium gray; HCl - yes; chalky luster; massive with some medium brownish gray, highly distorted silty laminae; tuff at top and analcitized tuff at 379.0; marlstone zones at 378.55 - 378.8, 379.65 - 379.75 and 381.25; fractured 389.0, 389.8, 391.3; fracture zone with common pyrite 400.5 - 400.8; fractured 401.7, 402.0, 403.2, 403.8; soft tuffs 404.2 and 404.55; fractured 406.6 and 407.3 - 407.8; fracture traces 409.0 - 410.0; jumbled at 413.2 with possible fractures; fractured at 414.2 with fracture traces 415.0 - 416.0. 392.45 - 393.55 missing.

416.1 - 431.8

Sandstone - light and medium gray to medium brownish gray; HCl - yes; chalky

luster; massive with common distorted silty and marly laminae; minor fracture at 417.0; fractured 417.55 - 418.0; solution cavity with pyrite at 421.35; fractured 422.0 and 422.8 - 423.0; tuffs at 423.5, 423.8, 424.3, and 425.7; solution cavity with crystalline pyrite at 427.45; fractured at 427.8; solution cavity at 428.1; solution cavity with massive pyrite at 429.7; fractured with common gilsonite 430.3 to bottom.

431.8 - 443.5

Oil shale - medium brownish gray with some light brownish gray and rare dark brownish gray; HCl - yes; earthy luster; laminated to faintly laminated with common streaked and some distorted bedding; fractured from top to 433.3 with calcite coating and some oil staining; siltstone zones with tuff stringers 432.0 - 432.6 and 432.8 - 433.1; tuff at 433.5; zones of calcite and gilsonite with some soft tuffs at 434.05, 434.55, 435.5, 435.8, 437.1 - 437.4, 438.15 - 439.45, 439.65, 440.0, 440.25, 441.9, and 443.2, common solution and pitting of these zones.

443.5 - 462.1

Oil shale - light to medium brownish gray with rare dark brownish gray; HCl - yes; earthy luster; laminated to faintly laminated with common streaked bedding, some loop structures and distorted bedding; zones of brownish sandstone 443.65 - 443.85, 444.6, 447.15 - 447.75, 448.2 - 449.0, 449.6, 456.0 - 456.25, and 458.0 - 458.4; fractured at 444.0, 446.6 and 448.8; jumbled zone with gilsonite at 449.3; 450.6 - 451.3 solution cavity with fractures and common calcite; 452.0 - 454.7 has common calcite, pyrite and gilsonite in probable shattered zones; dolomite stringer at 452.4; calcite with tuff at 455.35, load casting into upper bedding; tight fractures 460.5 and 461.8.

462.1 - 469.2

Sandstone - light to medium brown; HCl - yes; chalky luster; massive with some distorted marlstone zones and laminae throughout; marlstone zones at 462.9, 463.1, 464.6, 465.05, 465.3, 465.6, and 466.6; common pyrite blebs throughout; fractured at 466.7.

469.2 - 484.9

Oil shale and sandstone - alternating zones of light to medium brownish gray oil shale and light to medium brown sandstone; HCl - yes; chalky to earthy luster; oil shale is laminated with common distorted bedding, rare loop structures and common interbedded sand; sandstone is massive with some distorted oil shale laminae; fractured and jumbled 471.25 and 472.6 - 473.3; sandstone zones have common pyrite blebs throughout.

484.9 - 496.0

Oil shale - light brownish gray with common medium and some dark brownish gray; HCl - minor; earthy with some satiny luster; laminated with common streaked and distorted bedding, some loop structures; tuff blebs at 485.3, mildly distorting bedding above and below; fractured 489.1 - 489.5 and in rich zone from 488.8 - 490.75; fractured from 492.0 - 493.0 with calcareous coating; thin, partially analcitized tuff at 494.6; some tuff blebs throughout interval.

496.0 - 509.9

Oil shale - light, medium and dark brownish gray; HCl - no to minor; earthy with rare satiny luster; laminated to faintly laminated with common streaked, some distorted bedding; buff colored tuff stringers 496.75 - 497.0; fracture zones with calcite, pyrite and gilsonite associated with solution and heavy pitting 498.4 - 499.2, 502.0 - 502.3 and 508.35 - 509.8; solution cavities with crystalline calcite and pyrite 502.3, 503.4 and 504.7 - 505.0; fractured 503.7 and 504.0 - 504.4; tuffs with calcite and oil staining at 506.7 and 507.5; fractured 507.4 - 507.9. 509.8 - 509.9 missing. 500.2 - 501.15 missing.

509.9 - 515.75

Oil shale - medium brownish gray; HCl - minor to yes; earthy with some satiny luster; faintly laminated with common streaked bedding; fractured from top to 511.25; tight fracture traces 511.25 to 513.0; solution cavity with crystalline calcite at 511.4; tuff at 512.8; zone of heavy pitting and solution with common small fractures, calcite and some tuffs 513.15 - 514.3; solution zones 514.5, 514.7 and 514.9, with crystalline calcite, possible tuffs and probable fractures.

- 515.75- 519.6 Oil shale - light to medium brownish gray; HCl - no to minor; earthy luster; laminated with some loop structures and distorted bedding; fractured at 517.55; common tuff streaks and stringers throughout.
- 519.6 - 531.65 Oil shale - medium to dark brownish gray; HCl - minor; earthy luster; faintly laminated with common streaked, some distorted, bedding; fracture trace at 521.2; fractured at 521.15 and 523.1; solution zones 524.55 and 525.25; solution zone with boxworks and calcite crystals 525.3; solution of tuff 525.9; 526.65 - 528.3 (above and below missing interval) are heavily pitted with some solution of minor fractures with common calcite; tuffs at 529.95 and 531.35; some tuff stringers throughout interval. 526.9 - 528.1 missing.
- 531.65- 533.5 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated with some distorted bedding; tuff stringers at 532.35 and 532.7. 533.0 - 533.5 Compressive Strength Sample.
- 533.5 - 541.15 Oil shale - medium to dark brownish gray with some light brownish gray; HCl - minor to yes (light sections); earthy with common satiny luster; laminated with common streaked, some distorted, bedding; partially retorted in tuff and oil shale zones 533.5 - 534.0, 539.9 and 543.15 - 543.35; tuff with oil staining 533.35; irregular tuff at 538.1; tuff at 538.4 - 538.5; partially analcitized tuff 539.85, distorting upper bedding; buff colored tuff at bottom.
- 541.15- 543.5 Oil shale - medium to dark brownish gray and black; HCl - no; satiny with common vitreous luster; laminated with common streaked and distorted bedding; slumpage zone at 542.1; partially retorted 543.15 - 543.4; some buff colored tuff streaks throughout.
- 543.5 - 548.0 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked bedding; irregular, analcitized tuff at 547.9.

548.0 - 564.2

Oil shale - medium to dark brownish gray; HCl - minor; earthy to satiny luster; faintly laminated with rare laminations and common streaked bedding; oil stained tuff at 548.95; irregular analcitized tuffs 551.2, 552.7, 553.7, 559.75, and 560.0; tuff stringers from 561.0 - 562.0, with analcitized tuffs 562.0 and 562.15; interbedded tuff zone at 562.7; irregular tuff at 563.9, distorting bedding above and below.

564.2 - 576.9

Oil shale - medium brownish gray with some dark brownish gray; HCl - yes; earthy, with common satiny luster; laminated to faintly laminated with common streaked, some distorted bedding; irregular tuff stringer at 565.35; tuffs at 570.75 and 571.5; tuff with oil staining at 572.15; wavy tuff at 573.0; gray tuff blebs at 574.65; interbedded, partially analcitized tuff at 575.8; rare tuff stringers throughout interval.

576.9 - 588.95

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor; earthy to satiny luster; laminated with rare loop structures; some streaked, common distorted, bedding; tuff with calcite and oil staining 579.85, distorting lower bedding; soft tuff at 580.75; partially analcitized tuff with some oil staining at 582.4; common, light gray tuff streaks and stringers throughout interval.

588.95- 601.4

Oil shale - medium to dark brownish gray; HCl - no to minor; earthy to satiny, with rare vitreous luster; laminated with some loop structures, common distorted bedding; irregular steel gray tuff at 589.15; interbedded analcitized tuff at 592.85, distorting lower bedding; buff colored tuffs 594.5 and 596.0; analcitized tuffs 599.55, 599.75 and 600.0; minor pitting 600.0 - 601.0; irregular tuff 601.15, distorting lower bedding.

601.4 - 606.45

Oil shale - light, medium and dark brownish gray; HCl - minor to yes (light sections); earthy luster; laminated with common loop structures and distorted bedding; some light gray tuff stringers throughout.

- 606.45- 608.7 Oil shale - medium to dark brownish gray and black; HCl - minor; satiny to vitreous luster; laminated with some loop structures, common distorted bedding; analcitized tuff at 607.25, distorting upper bedding; some tuff streaks and stringers throughout.
- 608.7 - 620.3 Oil shale - light, medium and dark brownish gray; HCl - minor; earthy to satiny luster; laminated with common loop structures and distorted bedding, some streaked bedding; irregular tuff with minor pitting 612.05; white tuff at 612.5; irregular tuff at 616.2; common tuff streaks and stringers throughout.
- 620.3 - 622.65 Oil shale - dark to medium brownish gray with rare light brownish gray; HCl - minor; satiny with some vitreous luster; faintly laminated to laminated with common streaked bedding; pitting of tuff stringer 621.75; irregular analcitized, blebby tuff 621.9; some tuff stringers and streaks throughout.
- 622.65- 628.0 Oil shale - medium to dark brownish gray with some light brownish gray; HCl - no; earthy with some satiny luster; laminated with some loop structures and streaked bedding, common distorted bedding; irregular blebby tuff 623.8, partially analcitized tuff 624.15; irregular tuff zone and blebs 626.6.
- 628.0 - 629.85 Oil shale - dark brownish gray to black with some light and medium brownish gray; HCl - no; satiny to vitreous with some earthy luster; laminated with some loop structures and streaked bedding, common distorted bedding; light colored zone exhibiting flowage 628.3 - 628.85; rare tuff streaks and stringers throughout.
- 629.85- 635.1 Oil shale - light and medium brownish gray with rare dark brownish gray; HCl - minor; earthy luster; laminated with some loop structures, rare streaked, some distorted bedding; irregular white tuffs in zone 633.3 - 633.7; some tuff stringers throughout.

- 635.1 - 636.6 Oil shale - medium to dark brownish gray and black; HCl - minor; earthy to satiny and vitreous luster; laminated with rare loop structures, common distorted bedding.
- 636.6 - 640.9 Oil shale - light, medium and dark brownish gray; HCl - minor; earthy luster; laminated with rare loop structures, common streaked bedding; irregular, blebby tuff 637.3; some tuff streaks and stringers throughout.
- 640.9 - 642.85 Oil shale - medium to dark brownish gray with rare light brownish gray, HCl - no; earthy to satiny luster; laminated to faintly laminated with common streaked bedding, common distorted bedding; tuff with oil staining 641.65.
- 642.85- 656.5 Oil shale - light to medium brownish gray with some dark brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked, some distorted bedding, rare loop structures; analcitized tuff stringers 649.4, 650.0, 651.3 (with gilsonite), 652.0, 652.5 - 652.7 and 653.85; blebby tuff zone 654.0; altered tuff 654.4 - 654.7; some tuff streaks and stringers throughout.
- 656.5 - 658.35 Oil shale - medium to dark brownish gray; HCl - no; earthy with some satiny luster; laminated with common distorted bedding; zone from 657.1 - 657.5 exhibits slump and flowage; partially analcitized tuffs bleeding oil 658.1 and 658.25, distorting bedding above and below.
- 658.35- 660.45 Oil shale - medium to dark brownish gray; HCl - minor; earthy with some satiny luster; laminated with common streaked and distorted bedding; interbedded tuffs at top, 658.85 and 660.1; some tuff streaks throughout.
- 660.45- 663.4 Oil shale - light to medium brownish gray with rare buff; HCl - no to minor; earthy luster; laminated to faintly laminated with common streaked and distorted bedding, some loop structures; light gray tuff 661.1; fractured with oil staining 661.5; zone of interbedded tuffs 662.0 - 662.35; darker colored zone 662.75 - 662.95; white tuff at 663.15.

663.4 - 664.7

Oil shale - medium to dark brownish gray; HCl - no; satiny to vitreous luster; laminated with common loop structures and distorted bedding; retorted from 663.7 - 664.4.

664.7 - 684.35

Oil shale - light, medium and dark brownish gray; HCl - minor to yes (light zones); earthy luster; laminated with common streaked and distorted bedding; analcitized tuffs 666.8 - 667.0, 667.45, 669.0 - 669.1, 669.35, 669.95, and 670.25; tuff 672.15 - 672.25; partially retorted 673.7; analcitized tuffs 674.75 and interbedded 677.2 - 677.9, 678.4 - 678.6, 678.8, 679.35, 680.25 - 680.65 and 681.35 - 681.85; some medium gray tuff streaks throughout.

684.35 - 704.0

Oil shale - medium brownish gray with rare light and dark brownish gray; HCl - minor to yes; earthy with rare satiny luster; faintly laminated to laminated with common streaked, some distorted bedding; white tuff at 685.1; interbedded analcitized tuffs 686.55 - 687.0; analcitized tuffs 693.7, 694.0, 697.65, 697.65, and 700.6; minor load casting below tuffs, little distortion; wavy gray tuff at 701.4. 686.2 - 686.75 Compressive Strength Sample.

704.0 - 723.15

Oil shale - medium to dark brownish gray; HCl - yes; earthy with rare satiny luster; faintly laminated with rare laminations, common streaked, with some distorted bedding; analcitized tuff at 707.65; very tight fracture 710.3 (10°); tuff with oil staining 711.25; zone from 711.75 - 713.55 contains interbedded tuffs with common oil staining, some pitting throughout; irregular tuff at 721.8.

723.15 - 736.1

Oil shale - medium brownish gray with some dark brownish gray; HCl - yes; earthy luster; faintly laminated with common streaked bedding; fractured from 726.0 - 727.4, calcite coating; irregular gray tuffs 727.7 and 729.0; interbedded light gray, blebby tuff at 732.5; fractured from 734.85 - 736.1, dolomitic coating; rare dark gray tuff streaks throughout interval.

736.1 - 756.3

Oil shale - medium to dark brownish gray; HCl - minor to yes; earthy luster; laminated to faintly laminated with common streaked, some distorted, bedding, and rare loop structures; fractured at 736.85; drilling breakage and possible fractures 737.0 - 738.0; fractured from 737.6 - 739.4 with dolomitic coating; irregular analcitized tuffs 754.2, 754.4 and 754.85.

756.3 - 765.3

Oil shale (becoming leaner to bottom of interval) - light, medium and dark brownish gray; HCl - yes; earthy with some satiny luster; laminated with some loop structures; common streaked and some distorted bedding; interbedded tuffs 757.4 - 758.1; irregular white tuffs with some pitting 761.75 - 761.9; some interbedded tuffs 762.0 - 763.0; tuff at 763.7; common dark gray tuffs 764.0 to bottom. 762.35 - 762.85 Compressive Strength Sample.

765.3 - 768.6

Marlstone (silty) - buff to light brownish gray with some medium brownish gray; HCl - yes; earthy luster; laminated with rare distorted bedding; pitted core 767.0 - 767.3; rare dark gray tuff streaks throughout. "A" GROOVE.

768.6 - 772.05

Oil shale (lean) - light, medium and dark brownish gray; HCl - no; earthy with rare satiny luster; laminated with common distorted, some streaked bedding; blebby tuff at 769.25; irregular tuffs distorting bedding at 769.75, 769.95, 770.15; irregular analcitized tuff at 770.9.

772.05- 777.0

Oil shale - buff to light, medium and dark brownish gray (alternating light and dark zones) - HCl - no to minor; earthy with rare satiny luster; laminated with common loop structures and distorted bedding; common tuff blebs distorting bedding throughout; analcitized tuff at 773.0; dark gray, irregular tuff at 773.6; analcitized tuffs 775.0, 775.3, 775.5, and 775.85; tuff zones 776.1 - 776.3, 776.4 and 776.7 - 777.0 (highly distorting bedding). BOTTOM "A" GROOVE about 776 ft.

- 777.0 - 781.4 Oil shale - medium to dark brownish gray; HCl - no; earthy to satiny luster; laminated with some loop structures, common distorted bedding; analcitized tuffs 777.2 and 777.55; medium gray blebby tuff at 777.75; irregular tuff stringers and blebs 778.1 - 778.4; light gray tuff with oil staining 780.65; 780.75, gray load casted tuff with analcitized tuff at 780.85. 780.65 - 781.4 Bureau of Mines Sample. 779.15 - 779.8 Compressive Strength Sample. PARTING SURFACE - 780.05.
- 781.4 - 788.55 Oil shale - light to medium brownish gray with rare buff and dark brownish gray; HCl - no; earthy luster; laminated with rare loop structures, some streaked and distorted bedding; interbedded, blebby tuff 781.65 - 781.9; tuff stringers 782.5 - 783.0; dark gray tuff at 788.35; light gray, analcitized tuff at 788.5, distorting lower bedding.
- 788.55- 789.05 Tuff - gray to steel gray; HCl - no; chalky luster; oil staining upper portion; burnt in drilling. MAHOGONY MARKER.
- 789.05- 792.1 Oil shale - buff to light and medium brownish gray; HCl - no to minor; earthy luster; laminated (color banded) with rare loop structures, common streaked and distorted bedding; irregular dark gray tuff with minor pitting at 792.0.
- 792.1 - 794.3 Oil shale - medium to dark brownish gray; HCl - minor; satiny to vitreous luster; laminated with common streaked, rare distorted, bedding; interbedded, very fine, buff-colored, tuff stringers top to 792.55; irregular tuff 794.05.
- 794.3 - 795.4 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated with rare distorted bedding; very thin, irregular tuff at 795.2.
- 795.4 - 798.85 Oil shale - medium to dark brownish gray; HCl - minor; satiny with common vitreous luster; laminated with some streaked and distorted bedding; buff and light gray irregular tuffs, distorting lower bedding 796.1, 796.25 and 796.4; very irregular

827.8 - 835.9

Oil shale - light, medium and dark brownish gray; HCl - yes; satiny luster; laminated with common streaked and distorted bedding; top to 828.4 is zone of nahcolite and halite with some oil shale, heavy solution of zone; fractured from 833.0 - 835.9 with pyritic coating, fairly open fracture. 831.3 - 831.85 Compressive Strength Sample.

835.9 - 840.1

Oil shale - light, medium and dark brownish gray; HCl - minor; satiny luster; laminated with some loop structures, common streaked and distorted bedding; irregular, interbedded tuff at 837.0; medium gray tuff distorting upper and lower bedding at 839.0; light gray tuff stringers 839.15, 839.3 and 839.8.

840.1 - 842.65

Oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with rare loop structures, some distorted bedding; irregular tuff at 840.45; micro-faulting at 841.0; analcitized tuffs at 842.3 and 842.55.

842.65- 847.65

Oil shale - light, medium and dark brownish gray; HCl - no to minor; earthy to satiny luster; laminated with some loop structures and streaked bedding, rare distorted bedding; analcitized tuff at top of interval; 843.1 - 843.3 and 846.0 - 846.6 contain common interbedded tuff stringers; gray analcitized tuff 844.25 - 844.65; irregular gray tuff at 844.95; analcitized tuffs 845.75 and 846.7; common dark gray tuff streaks and stringers from 847.1 to bottom.

847.65- 849.15

Oil shale - buff to light and medium brownish gray; HCl - no; earthy luster; laminated with common streaked and some distorted bedding, rare loop structures; common dark gray tuff stringers throughout interval.

849.15- 852.05

Oil shale - medium to dark brownish gray and black; HCl - no; satiny to vitreous luster; laminated with some loop structures and rare distorted bedding; 850.1 - 850.8 contains common interbedded buff-colored tuff stringers; irregular analcitized tuff at 851.95.

- 852.05- 854.3 Oil shale - buff to light and medium brownish gray; HCl - yes; earthy luster; laminated with some distorted bedding; fracture trace about 10° at 853.1; light gray tuff at 853.55; interbedded tuffs highly distorting lower bedding 853.7 - 854.0.
- 854.3 - 860.0 Oil shale - light, medium and dark brownish gray; HCl - no to minor; earthy and satiny with some vitreous luster; laminated with some streaked, common distorted bedding; analcitized tuff 855.25 - 855.65; common interbedded tuff stringers 855.65 - 856.0; tuff stringers and blebs, distorting bedding 856.2 - 856.6; irregular tuff 856.6 - 856.85; analcitized tuff 859.05 - 859.4; rare dark gray tuff streaks throughout interval.
- 860.0 - 867.5 Oil shale - buff to light and medium brownish gray with rare dark brownish gray; HCl - no; earthy luster; laminated with some loop structures, common distorted bedding; partially analcitized tuff, distorting lower bedding at 860.9; solution cavity at 861.8; dolomite (?) bands at 862.2 and 862.6; fractured from 865.75 - 867.15, calcareous fracture coating.
- 867.5 - 871.65 Oil shale (lean) - buff to light brownish gray with some medium brownish gray; HCl - minor; earthy luster; laminated with some loop structures; analcitized tuff with oil shale band 867.7 - 867.85; irregular, light gray tuff at 868.5, load casted into lower bedding, mild bedding distortion; light gray tuff 869.5 - 869.65; common pyritic stringers parallel to bedding 870.75 to bottom. 871.35 - 871.85 Compressive Strength Sample. BOTTOM MAHOGONY ZONE.
- 871.65 - 883.1 Mudstone - light gray to light brownish gray with rare medium brownish gray; HCl - minor; earthy to chalky luster; laminated to massive with common distorted bedding; fractured from top to 874.8, very tight fractures with dolomitic coatings, some oil staining, minor pitting of fracture traces; open fracture at 874.0;

from 874.8 to 877.55 is mudstone and tuffs with moderate to heavy pitting and solution, common pyrite and some oil staining throughout, tuff zones are 874.8 - 875.25, 875.6 - 875.9 and 876.95 - 877.55, interbedded tuffs common throughout; 877.55 - 883.1 is fractured with no separation or breakage on fracture planes, all fractures are pyrite filled with up to 9 fractures per foot; solution cavity with abundant pyrite at 881.15; core at 882.15 - 882.3 has been shattered and recemented with dolomite, shattering possibly caused by interbedded white tuffs distorting bedding from 882.35 - 883.1. "B" GROOVE.

883.1 - 886.65

Oil shale - medium to dark brownish gray; HCl - no; earthy to satiny luster; common streaked and highly distorted bedding, some lamination; some pitting at 883.9 with common gilsonite, bedding distorted above and below zone although no evidence of crystalline growth; some, small tuff blebs from 885.0 to bottom, locally distorting bedding. TOP "R-6".

886.65- 894.2

Oil shale - light, medium and dark brownish gray; HCl - yes; earthy luster; laminated with some distorted bedding and some loop structures; light gray tuff at 889.0; bedding from 889.0 - 889.35 exhibits microfaulting with minor displacement of laminae; orangish white tuff 891.75 - 891.9; irregular light gray to white tuff at 891.35, distorting lower bedding; light gray to white tuff 892.8 - 893.0; common medium gray tuff stringers and streaks throughout. 887.25 - 887.75 Compressive Strength Sample.

894.2 - 900.3

Oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated (color banding) with some distorted bedding; light gray tuff zone at 895.3, mildly distorting upper and lower bedding; steel gray tuff 895.5 - 895.6; 895.9 - 896.2 contains irregular interbedded tuffs distorting upper and lower bedding, some pitting and solution; light gray to white tuff at 897.75; light to medium gray tuff at 898.9; very tight microfractures 898.9 - 899.75; common tuff stringers with some tuff streaks throughout.

900.3 - 904.5

Oil shale - light, medium and dark brownish gray with some medium greenish brown; HCl - no; earthy luster; laminated with some distorted bedding; dark gray tuff at 900.6; upper and lower bedding distorted by dark gray tuff bleb at 901.1; steel gray, partially analcitized tuff 901.4 - 901.5, interbedded along upper surface; very tight, calcite coated fractures 902.4 - 902.8; common tuff streaks and stringers throughout.

904.5 - 913.25

Oil shale - light, medium and dark brownish gray; HCl - minor; earthy with rare satiny luster; laminated (color banding) with rare loop structures, streaked and distorted bedding; light gray tuff at top of interval; medium gray tuff 906.4 and 907.1 - 907.4; buff-colored tuff 911.0 - 911.1 with dead oil, highly distorting upper and lower bedding; common tuff streaks, stringers and blebs throughout.

913.25- 915.0

Oil shale - medium to dark brownish gray; HCl - minor; satiny to vitreous luster; laminated with rare loop structures, common distorted bedding; microfaulting with some displacement at top to 913.6; irregular, analcitized tuff at 914.75, distorting upper and lower bedding.

915.0 - 918.3

Oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with rare distorted bedding; common medium gray tuff stringers and bands throughout; medium brown tuff at 917.5.

918.3 - 920.45

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor; earthy to waxy luster; laminated with common streaked and distorted bedding; interval contains zones of rich shale containing buff-colored spots along bedding which are probably algal remains (previously noted as tuffs, above A-Groove), zones at top to 918.85, 919.05, 919.15 - 919.35, and 920.2 to bottom.

920.45- 927.15

Oil shale - medium to dark brownish gray with some light brownish gray; HCl - minor; earthy with common vitreous to waxy luster; laminated with common

distorted, some streaked, bedding; interbedded tuffs from top to 921.7, locally distorting bedding, algal (?) zones 923.95 - 924.2, 924.45 - 924.65, and 925.5 - bottom; dark gray tuff at 925.8.

927.15- 928.45

Oil shale - light with some medium brownish gray; HCl - minor; earthy luster; laminated with some distorted bedding; very tight fractures (about 0°) at 927.8; common medium gray tuff streaks and stringers throughout.

928.45- 933.65

Oil shale - medium to dark brownish gray; HCl - no; satiny with some vitreous and waxy, rare earthy, luster; streaked bedding with some laminations, common distorted bedding; algal zones (?) 929.1 - 930.2 and 933.0 to bottom; 932.1 - 933.0 contains common light and medium gray tuff stringers.

933.65- 940.6

Mudstone and tuff - light and medium brownish gray to light and medium gray to bluish gray; HCl - no; chalky to earthy luster; laminated with rare distorted bedding; some very tight, pyrite filled vertical fractures throughout.

940.6 - 943.0

Mudstone - buff to light brownish gray; HCl - no; chalky luster; laminated to massive with some mildly distorted laminae; common pyrite streaks and stringers throughout.

943.0 - 947.05

Oil shale - medium to dark brownish gray with some light greenish brown; HCl - no; satiny to vitreous luster with some earthy luster; laminated with common streaked and some distorted bedding; algal zones (?) 944.25 - 944.4, 945.1 - 945.35, 945.6 - 945.85, and 946.05 - 946.35; very tight vertical fracture at 944.8; some pitting of tuff at bottom; some tuff streaks and stringers throughout.

947.05- 952.4

Oil shale (lean) - light to medium brownish gray; HCl - yes; earthy luster; laminated with common distorted bedding; light gray, interbedded tuffs present throughout interval; analcitized tuff at 947.7.

952.4 - 958.2

Oil shale - medium to dark brownish gray and black; HCl - no; satiny to vitreous luster; some laminations, common streaked and distorted bedding; irregular tuffs with dolomite 952.55 and 952.65; analcitized tuff stringer at 952.8; slump zones 953.1 - 953.25 and 954.75 - 955.0; large tuff bleb at 955.75 distorting upper and lower bedding; analcitized tuff at 955.9; irregular tuff stringers and blebs throughout interval, distorting upper and lower bedding.

958.2 - 962.25

Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated with some loop structures, rare distorted bedding; irregular, partially analcitized, brown tuff at top, distorting upper and lower bedding; common light gray tuff stringers throughout; tight fracture at 961.0. 959.25 - 959.75 Compressive Strength Sample.

962.25 - 965.7

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - no; earthy luster; laminated with rare loop structures and distorted bedding, some streaked bedding; common interbedded tuffs from top to 962.5; tuff stringers 962.7, 962.75 and 962.85; common light gray tuff and pyritic stringers 964.45 to bottom.

965.7 - 971.9

Oil shale and marlstone - light gray to light and medium brownish gray; HCl - yes; earthy luster; laminated with common distorted, some streaked, bedding; common tuff and some pyrite stringers, top to 966.6; slump and flowage structure at 966.75; medium brown analcitized tuff at 970.7; blebby, medium brown, analcitized tuff at 970.9; common medium gray tuff stringers 971.1 to bottom.

971.9 - 976.9

Oil shale - medium brownish gray with some dark brownish gray and some medium greenish brown; HCl - no; earthy with rare satiny luster; fractured from 974.4 - 976.0; gilsonite streak at 976.4; common light to medium gray tuff stringers and streaks throughout.

- 976.9 - 983.0 Siltstone - light gray and light brownish gray; HCl - yes; chalky to earthy luster; common marlstone laminae, some sandstone stringers, typically massive.
- 983.0 - 988.3 Siltstone and marlstone - light gray to light brownish gray; HCl - yes; earthy and chalky luster; laminated with common distorted bedding; sandstone stringers throughout; pitting and solution of core 985.45 and 986.45; deformation of upper bedding by crystal growth from 987.6 - 988.0, heavy pitting and solution in interval.
- 988.3 - 989.7 Oil shale - medium to dark brownish gray; HCl - no; satiny luster; laminated with common streaked and distorted bedding; bedding distorted at top by medium gray, blebby tuff; algal zones (?) common throughout.
- 989.7 - 993.5 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with common streaked, rare distorted bedding; thin, brown, tuff stringer at top and 990.0; medium gray, analcitized tuff at 990.8; common medium gray tuff streaks and stringers throughout.
- 993.5 - 1003.7 Oil shale - light to medium brownish gray with some dark brownish gray; HCl - minor; earthy luster; laminated to faintly laminated with rare loop structures, common streaked, and some distorted, bedding; irregular, light gray, blebby tuff distorting upper and lower bedding at 999.35; irregular light gray tuff at 1001.7, distorting upper and lower bedding; irregular pyrite bleb at 1002.75; common light to medium gray tuff streaks and stringers throughout.
- 1003.7 - 1013.9 Oil shale - medium to dark brownish gray; HCl - minor; earthy with rare satiny luster; some laminations, common streaked and distorted bedding; microfaulting and crystal growth distortion 1004.9 - 1005.2 and 1005.3 - 1005.9; irregular medium brown tuff at 1005.9, distorting lower bedding; solution of crystal growth at 1006.95, upper bedding highly distorted; wavy tuff exhibiting slump at 1007.75;

analcitized tuff 1010.75 - 1011.0
distorting upper and lower bedding;
common light and medium gray tuff streaks,
stringers, and blebs throughout interval.
BOTTOM "R-6".

1013.9 -1018.35

Siltstone - light to medium gray and light brownish gray; HCl - yes; chalky to earthy luster; laminated to banded with common distorted bedding; soft, clayey zone at top; zone of small random tuff blebs 1016.8 - 1016.9; solution of crystal growth at 1017.15, lower bedding mildly distorted; zone of buff sandstone stringers 1017.2 - 1017.5, massive, soft sandstone 1017.5 - 1017.7; very tight fracture trace at 1017.8. 1014.4 - 1014.95 Compressive Strength Sample.

1018.35-1021.95

Mudstone - light to medium brownish gray; HCl - no; earthy luster; laminated to banded with some kerogen-rich laminae, common streaked bedding; zone of buff, interbedded sands at top to 1018.5, thin tuff stringer with pyrite at bottom; common pyrite streaks and stringers throughout interval, parallel to bedding.

1021.95-1024.0

Siltstone - light gray to light brownish gray; HCl - yes; chalky to earthy luster; some kerogen-rich and massive sandstone laminae.

1024.0-1031.45

Mudstone with some oil shale - medium brownish gray to medium greenish brown with rare light brownish gray; HCl - no; earthy luster; laminated with common streaked, and some distorted bedding; irregularly bedded, medium brown tuff distorting upper bedding at 1024.4; interbedded tuffs distorting lower bedding at 1024.7; tuff at 1024.9; medium brown tuffs 1028.8 and 1029.1; medium brown, partially analcitized tuff 1030.85 - 1030.95; common pyrite streaks and stringers 1026.0 to bottom; some tuff stringers throughout.

1031.45-1033.0

Siltstone and marlstone - light gray to light and medium brownish gray; HCl - yes; earthy luster; common kerogen-rich laminae, massive, with rare distorted bedding; bedding above and below 1032.75 distorted by crystal growth, solution cavities filled with dead oil.

- 1033.0 -1037.75 Oil shale and marlstone - medium brownish gray to medium greenish brown; HCl - minor; earthy luster; laminated with common streaked, some distorted bedding; bedding distorted at top to 1034.3 by slump (?), common pyrite stringers in zone; medium brown tuff, partially analcitized at 1030.95; common pyrite streaks and stringers throughout interval.
- 1037.75-1043.3 Siltstone - light to medium gray; HCl - yes; chalky luster; common medium brownish gray marly laminae throughout; common solution pits 1039.85 - 1041.7; common pyrite streaks and stringers throughout.
- 1043.3 -1047.8 Mudstone with some oil shale - medium greenish brown to medium brownish gray; HCl - no; earthy luster; laminated with common streaked bedding; light to medium gray tuff stringers 1044.25, 1044.3, 1044.5, 1044.65, and 1044.85; fractured at 1046.8, orangish, hydrocarbon fracture coating, fracture is in a light gray to white, partially analcitized tuff from 1046.8 - 1046.9; gilsonite streak at 1047.7; common pyrite streaks and stringers throughout interval.
- 1047.8 -1051.35 Siltstone - light to medium gray; HCl - minor; chalky luster; massive with some marlstone laminae; light to medium brown analcitized tuff top to 1048.05, distorting lower bedding; common pyrite streaks and stringers throughout interval.
- 1051.35-1054.3 Oil shale with some marlstone - light to medium brownish gray and medium greenish brown; HCl - minor; earthy to satiny luster; laminated with common streaked bedding; retorted 1053.5 - 1053.7; buff-colored tuff at 1053.8; common pyrite streaks and stringers throughout interval.
- 1054.3 -1064.9 Sandstone - medium gray to bluish gray; HCl - yes; chalky luster; massive with common, distorted siltstone and marlstone laminae, becoming more prevalent toward bottom. Correlate with previous holes - 50 ft. below R-6.
- 1064.9 -1069.7 Oil shale - light to medium brownish gray with rare dark brownish gray; HCl - minor;

earthy luster; laminated with some streaked bedding; leaner at top and bottom; partially analcitized, medium gray tuff at 1066.5; two very tight fracture traces 1067.55 and 1067.65; common, medium gray tuff stringers throughout interval.

1069.7 -1071.55

Sandstone - light gray to light brownish gray; HCl - yes; chalky luster; massive with some irregular laminations; marlstone interbedded 1070.0 - 1070.3.

1071.55-1077.6

Marlstone - light to medium greenish brown with common light to medium brownish gray; HCl - yes; earthy luster; laminated with rare distorted bedding; some kerogen-rich zones; tuff stringer at 1077.25; common pyrite streaks and stringers throughout.

1077.6 -1080.3

Sandstone - medium gray with common medium brownish gray; HCl - yes; chalky luster; massive with interbedded, distorted, medium brownish gray, sandy laminae.

1080.3 -1085.5

Siltstone - light to medium gray; HCl - yes; chalky luster; banded to massive; rare kerogen-rich laminae, becoming more common toward bottom.

1085.5 -1086.5

Oil shale - medium to dark brownish gray and dark greenish brown; HCl - no; earthy to satiny luster; laminated with common streaked and distorted bedding; medium gray tuff at 1086.2.

1086.5 -1090.35

Oil shale (lean) - light to medium brownish gray; HCl - minor; earthy luster; laminated with common medium gray siltstone laminae throughout; thin gray tuffs 1086.8 and 1086.85; tightly fractured from 1088.7 - 1089.8, open fracture from 1089.8 to bottom.

1090.35-1093.25

Sandstone - light to medium gray; HCl - yes; chalky luster; laminated with silty and marly laminae; fractured from top to bottom, very minor breakage on fracture.

1093.25-1098.9

Oil shale (lean) - light to medium brownish gray with common medium gray;

- HCl - minor; earthy luster; laminated with rare streaked and distorted bedding; common medium gray sandstone laminae and bands throughout; fractured from top to 1095.5, 1095.9 - 1096.4, and 1098.3 - 1098.8, no fracture coating; rare pyrite stringers from 1095.75 to bottom.
- 1098.9 -1100.1 Oil shale - medium to dark brownish gray and dark greenish brown; HCl - minor; earthy to satiny luster; laminated with common streaked and distorted bedding; blebby, irregular zones of massive pyrite 1099.5 and 1095.65; small, blebby, crystal growths distorting bedding; light brown tuff at bottom.
- 1100.1 -1102.8 Sandstone - light gray to light buff; HCl - yes; chalky luster; massive to banded with some marlstone laminae common at top, distorted bedding throughout; medium gray tuff at 1102.65.
- 1102.8 -1104.35 Marlstone - light to medium greenish brown with some medium brownish gray; HCl - yes; satiny luster; laminated with common streaked, rare distorted bedding; some kerogen-rich laminae throughout; partially retorted 1103.55.
- 1104.35-1107.05 Oil shale - medium to dark brownish gray and medium greenish brown; HCl - minor; satiny luster; laminated to faintly laminated with common streaked and distorted bedding; common buff-colored tuff (?) stringers from top to 1105.2; bedding distorted at top of interval with microfaulting; bleb of massive pyrite at 1105.3; slumpage from 1105.6 - 1106.0 with some small crystal growths distorting bedding; buff-colored tuff at 1107.0 with medium greenish brown marlstone to bottom.
- 1107.05-1115.4 Sandstone - light gray to light brownish gray and light greenish brown; HCl - yes; chalky luster; interbedded sands with some marlstone and siltstone, highly distorted bedding and cross bedding; light gray tuff at 1115.05.
- 1115.4 -1117.15 Marlstone - medium greenish brown; HCl - yes; earthy luster; laminated with common

distorted bedding, some light gray sandstone laminae interbedded throughout; shaly parting zone 1115.6 -1115.8; fractured from 1115.8 to bottom with bitumen coated fracture surface.

1117.15-1119.3

Oil shale - medium to dark brownish gray; HCl - yes; satiny to vitreous luster; faintly laminated with common streaked and distorted bedding, some laminations; dark gray, partially analcitized tuff at 1117.85; bedding distorted by small crystalline blebs throughout; fractured from top to 1117.85.

1119.3 -1120.45

Marlstone with some oil shale - light to medium greenish brown and light brownish gray; HCl - yes; earthy luster; laminated with some banding; some pyrite streaks and stringers at 1120.0; some interbedded, light gray sands throughout.

1120.45-1123.6

Sandstone, grading into marlstone - light gray to light and medium greenish brown; HCl - yes; chalky to earthy luster; massive to banded and laminated with some bedding distortion; microfaulting at 1121.7.

1123.6 -1127.95

Oil shale - medium to dark brownish gray and medium greenish brown; HCl - no to minor; satiny to vitreous luster; laminated to faintly laminated with common streaked and distorted bedding; distortion caused by small crystal growths in bedding; dark gray analcitized tuff 1124.7 - 1124.8; gilsonite stringer at 1126.3; some light gray tuff stringers 1126.0 to bottom.

1127.95-1130.9

Sandstone - light gray to light brownish gray; HCl - yes; chalky luster; massive to banded with color lamination; distorted bedding at top, load casting into lower laminae; fractured from 1130.1 to bottom, no fracture coating.

1130.9 -1133.1

Oil shale - medium to dark brownish gray; HCl - minor; earthy with some satiny luster; faintly laminated to laminated with common streaked and distorted bedding; fractured throughout interval, no fracture coating; gilsonite streaks at 1131.3; bedding distortion caused by small crystal growths.

- 1133.1 -1135.8 Sandstone - light gray to medium brown; HCl - yes; chalky luster; massive with color laminations, some cross bedding and slumpage throughout; interbedded tuff 1133.95 - 1134.05; fractured from top to 1135.2.
- 1135.8 -1143.4 Oil shale - light to medium brownish gray; HCl - minor; earthy luster; streaked bedding with some faint laminations, common distorted bedding; crystal growths throughout, distorting bedding; medium gray tuff at 1141.1, with common gilsonite; dark gray tuff at 1141.35; analcitized tuff at 1141.55, distorting upper and lower bedding; irregular, light gray tuff at 1141.8; buff-colored tuff at 1141.95; analcitized tuff at 1142.55.
- 1143.4 -1153.35 Sandstone and siltstone - light gray to light brownish gray; HCl - yes; chalky luster; massive to color laminated with interbedding of sands and silts throughout; dolomite layer at 1145.5; some kerogen-rich laminae 1146.5 - 1147.4, 1148.95, and 1150.1 - 1151.3.
- 1153.35-1157.1 Oil shale - medium with rare light and dark brownish gray; HCl - minor; earthy with rare satiny luster; faintly laminated with rare laminations, common streaked, and some distorted bedding; tuff flowage structure at 1154.85 with tuff filling crack to 1155.1.
- 1157.1 -1162.3 Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - no; satiny to vitreous with rare earthy luster; laminated to faintly laminated with common streaked, and some distorted bedding; gilsonite streak at 1157.6; irregular tuff with gilsonite at 1160.4; wavy pyrite stringers along flowage (?) zones at 1159.5; common pyrite streaks and stringers 1158.8 to bottom.
- 1162.3 -1166.2 Oil shale - light brownish gray with some medium, and rare dark, brownish gray; HCl - minor; earthy luster; faintly laminated with common streaked, rare distorted bedding; dark gray, analcitized tuff at top to 1162.55, lower bedding distorted with dolomite filling of load-

cast voids; fractured 1163.2 and 1164.4 - 1165.0; retorted 1164.1 - 1164.3.

- 1166.2 -1169.9 Oil shale - medium to dark brownish gray; HCl - no; satiny with some vitreous luster; laminated to faintly laminated with common distorted bedding; bleb of gilsonite at 1167.1, bedding above and below highly distorted; flowage or fillage feature with massive pyrite at 1167.2, irregular analcitized tuff at 1168.5; medium brown tuff at 1169.1; common light gray tuff stringers 1169.3 to bottom; gilsonite stringer 1167.3.
- 1169.9 -1173.8 Sandstone and siltstone - light gray and light brownish gray; HCl - yes; chalky luster; massive to laminated (lithologic laminations), common distorted bedding; light gray tuff stringer in kerogen-rich laminae; large gilsonite stringer 1172.65; very tight fracture 1171.7 - 1172.5.
- 1173.8 -1177.25 Siltstone and oil shale - HCl - yes; earthy luster; massive with kerogen-rich zones exhibiting distorted bedding 1174.05 - 1174.45 and 1176.65 - bottom, rare kerogen-rich laminae throughout remainder; dark gray tuff with load-casting at 1176.7 - 1176.8.
- 1177.25-1180.4 Sandstone and siltstone - light gray and light brownish gray; HCl - yes; chalky luster; massive to laminated (lithologic laminations), common distorted bedding; some kerogen-rich laminae from 1180.0 to bottom.
- 1180.4 -1183.8 Oil shale - light, medium and dark brownish gray; HCl - minor; earthy to satiny, with rare vitreous luster; faintly laminated with some laminations, common streaked and distorted bedding; irregular, buff-colored, tuff stringer at top; bedding distorted by crystal growths throughout; crystal bleb at 1183.25, distorting upper bedding mildly, lower bedding highly distorted.
- 1183.8 -1191.15 Sandstone and siltstone - light to medium gray and light brownish gray; HCl - yes; chalky luster; banded to laminated

- (lithologic lamination) with common distorted bedding; fractured from 1184.0 - 1186.2 with minor to moderate breakage.
- 1191.15-1194.5 Oil shale - light to medium brownish gray with some buff; HCl - yes; earthy luster; laminated to faintly laminated; fractured at 1192.0 with minor breakage, calcareous fracture filling with pyrite.
- 1194.5 -1196.85 Oil shale - medium, with some dark, and rare light, brownish gray; HCl - minor; earthy to satiny luster; irregular medium brown tuff at top, partially analcitized, upper and lower bedding distorted; gilsonite stringers 1195.5 and 1195.85; thin brown irregular tuff at 1196.1; microfaulting 1196.1 - 1196.3, minor displacement, pyrite filling of fault zones; some interbedded sands at bottom of interval.
- 1196.85-1201.3 Sandstone and siltstone - medium gray and medium brown; HCl - yes; chalky luster; lithologic laminations, highly distorted; fractured from top to 1108.2, minor breakage; kerogen-rich laminae 1198.9, 1200.05, 1200.7 - 1200.9, and 1201.15; common crystal growths distorting oil shale laminae.
- 1201.3 -1202.8 Siltstone and oil shale - buff to light brownish gray; HCl - yes; chalky with some earthy luster; laminated with some distorted bedding; microfaulting at 1202.3.
- 1202.8 -1206.45 Oil shale - light, medium, and dark brownish gray with rare buff; HCl - minor; satiny to resinous with some earthy luster; faintly laminated with common streaked and distorted bedding; gilsonite stringers 1203.8, 1204.2, and 1204.7; irregular light gray tuff at 1204.45, mildly distorting lower bedding; zone leans toward bottom with some siltstone.
- 1206.45-1208.5 Siltstone and sandstone - light brownish gray to medium gray; HCl - yes; chalky luster; lithologic laminations with common distorted bedding; some kerogen-rich zones 1207.8 to bottom.

- 1208.5 -1211.9 Siltstone and marlstone - light gray to light brownish gray and buff; HCl - yes; earthy luster; laminated with common streaked and some distorted bedding; rare kerogen-rich laminae throughout; some pyrite streaks and stringers top to 1210.2.
- 1211.9 -1217.55 Siltstone and oil shale - buff to light brownish gray with some medium brownish gray; HCl - yes; chalky to earthy luster; laminated with common distorted bedding; medium gray, irregular tuff at top, mildly distorting upper and lower bedding; fractured from 1213.1 - 1214.7 and 1215.3 to bottom; dark gray tuff at 1215.95; rare interbedded light gray sand stringers throughout interval.
- 1217.55-1220.4 Oil shale - medium to dark brownish gray; HCl - minor; satiny luster; laminated to faintly laminated with common streaked, rare distorted bedding, shaly parting 1218.8 - 1219.7; fractured to 1219.7, no fracture coating; light gray tuff (0.1 ft.) at 1218.7; upper and lower bedding mildly distorted; partially retorted 1219.8.
- 1220.4 -1225.1 Sandstone and siltstone - light gray to light brownish gray, rare medium brownish gray; HCl - yes; chalky luster; lithologic laminations with common distorted bedding; rare kerogen-rich laminae throughout.
- 1225.1 -1229.7 Siltstone with some oil shale - buff and light brownish gray; HCl - yes; chalky to earthy luster; laminated with common distorted bedding, kerogen-rich laminae becoming more common toward bottom; medium gray tuff stringers 1226.35, 1226.5, 1226.65, 1226.75, 1226.9, 1227.0, 1227.25, and 1227.3; irregular medium gray tuff stringer at 1228.35, mildly distorting upper and lower bedding.
- 1229.7 -1233.5 Oil shale - medium to dark brownish gray; HCl - no; satiny to vitreous luster; common streaked bedding, some faint laminations, common distorted bedding; common crystal blebs throughout, mildly, distorting bedding; gilsonite stringer at 1231.05; dark brown, analcitized tuff 1231.1 - 1231.2.

- 1233.5 -1235.95 Oil shale - light to medium brownish gray and medium greenish brown; HCl - yes; earthy with rare satiny luster; laminated with common streaked, rare distorted bedding; some light gray tuff blebs and stringers throughout.
- 1235.95-1240.2 Oil shale - medium to dark brownish gray; HCl - no; satiny to vitreous luster; streaked bedding with some faint laminations, common distorted bedding; some crystal (analcite?) blebs throughout; gilsonite stringers 1238.75 and 1239.8.
- 1240.2 -1247.1 Oil shale - medium brownish gray with some light and dark brownish gray and rare dark gray; HCl - minor; satiny with some earthy luster; laminated with common streaked and some distorted bedding; microfaulting at 1240.75; fracture with slickensides 1241.15; common gilsonite streaks and stringers 1243.8 - 1245.5; medium brown tuff at 1244.3; tight fracture traces 1246.1 and 1246.15; light gray tuff stringers 1246.45 and 1246.5; some pyrite streaks 1246.0 to bottom.
- 1247.1 -1252.0 Siltstone - light to medium brownish gray; HCl - yes; chalky luster; laminated to massive with common distorted bedding; some interbedded gray sand stringers throughout; soft, light brown, partially analcitized tuff at 1248.2, load casted into lower bedding; tight fracture trace at 1248.5; light brown tuffs at bottom, distorting upper and lower bedding, massive pyrite bleb and stringer above tuffs.
- 1252.0 -1255.75 Oil shale - dark brownish gray with some medium brownish gray; HCl - minor; satiny to vitreous luster, streaked bedding with some faint laminations, common distorted bedding; some interbedded tuffs at top, distorting bedding; crystal growth (analcite?) at 1252.3, distorting upper and lower bedding; common crystal streaks and stringers throughout.
- 1255.75-1258.0 Oil shale with some marlstone - light brownish gray with some medium brownish gray and buff; HCl - minor; earthy with some satiny luster; laminated to banded with common streaked and some distorted

- bedding; some interbedded tuff stringers throughout, more common in rich zone 1257.6 - 1258.0; gilsonite stringer at 1257.6.
- 1258.0 -1261.2 Siltstone with some sandstone - light brownish gray and light gray; HCl - yes; chalky luster; lithologically laminated to massive with common distorted bedding; rare kerogen-rich laminae throughout, more prevalent at bottom.
- 1261.2 -1264.3 Oil shale - medium to dark brownish gray; HCl - no; satiny with common vitreous luster; faintly laminated with some laminations, common streaked and distorted bedding; medium brown tuffs at 1262.4, mildly distorting lower bedding; irregular light gray tuff at 1263.3, mild distortion of lower bedding; gilsonite stringer at 1263.7.
- 1264.3 -1269.5 Siltstone and sandstone - light brownish gray and light gray; HCl - yes; chalky luster; lithologic laminations with common distorted bedding; kerogen-rich zone 1268.8 - 1269.9; massive sandstone 1268.9 - 1269.3.
- 1269.5 -1273.45 Oil shale - medium to dark brownish gray with some medium greenish brown; HCl - minor; satiny with some vitreous luster; faintly laminated to laminated with common streaked and distorted bedding; upper 0.2 ft. has load casted sand into irregular upper surface; tuff partially replaced by dolomite (?) 1272.35 - 1272.45, load casted into lower bedding; shaly parting 1272.45 to bottom; rare pyrite blebs and stringers 1271.0 - 1272.0.
- 1273.45-1275.4 Oil shale (lean) - light to medium brownish gray and light greenish brown; HCl - yes; earthy to satiny luster; laminated to faintly laminated with common streaked bedding, some distorted bedding; tight fracture traces 1274.0 and 1275.0; light gray, partially analcitized tuff at 1275.0; some medium gray tuff stringers throughout.
- 1275.4 -1278.1 Oil shale - medium, with some dark, brownish gray and rare light greenish brown;

HCl - minor; satiny luster; laminated to faintly laminated with some streaked, common distorted, bedding; light gray tuff stringer at top; dolomitized (?) thin tuffs 1275.75 and 1275.85; some gilsonite streaks 1276.5 - 1277.0; flowage of tuff (?) along microfault from 1277.4 upward to 1276.8.

1278.1 -1280.65

Siltstone and sandstone with some oil shale - light brownish gray and light gray with some medium brownish gray; HCl - yes; chalky with some earthy luster; lithologic laminations with common distorted bedding; kerogen-rich zones more common toward bottom.

1280.65-1284.05

Oil shale - medium brownish gray with rare dark brownish gray; HCl - minor; satiny luster; faintly laminated with common streaked, some distorted, bedding; shaly parting throughout; 1282.45 - 1282.75 tuff replaced by analcite (?); minor distortion of upper and lower bedding; fracture at 1283.6 exhibiting slickensides at 50° to vertical axis.

1284.05-1290.0

Siltstone and marlstone - light gray to light brownish gray with rare medium brownish gray; HCl - minor to yes; chalky to earthy luster; laminated with common distorted and streaked bedding; tight fracture at 1284.3; kerogen-rich zones 1284.85, 1285.7, 1287.0, and 1289.6.

1290.0 -1292.8

Oil shale with some siltstone - medium brownish gray with some light gray and light greenish gray; HCl - minor; satiny luster; common streaked and distorted bedding, rare laminations; buff-colored tuff stringers 1292.3; siltstone more common toward bottom of interval.

1292.8 -1295.0

Siltstone - light gray to light brownish gray; HCl - yes; chalky luster; laminated with common distorted bedding; rare interbedded sands throughout; irregular vertical fracture (?) filled with pyrite 1294.5 to bottom.

1295.0 -1296.95

Oil shale - medium to dark brownish gray; HCl - minor; satiny luster; laminated with some distorted bedding, shaly parting

- throughout; microfaulted at 1295.35 with minor offset; some microfaulted interbedded silts at 1296.6, distorting bedding.
- 1296.95-1300.55 Sandstone - fine grained; buff to light gray with some light brownish gray; HCl - yes; chalky luster; laminated to banded and massive; highly distorted bedding throughout; rare kerogen-rich laminae throughout; buff-colored tuff stringer at 1298.9.
- 1300.55-1304.1 Oil shale - medium brownish gray to medium greenish gray and greenish brown; HCl - minor; satiny luster; streaked bedding with some faint laminations, common distorted bedding; vertical flowage feature 1301.35 - 1301.7; bedding disrupted at 1302.1 by crystal growths; dark gray tuff at 1303.15, tuff flowage at 1303.3; crystal growths at 1303.9, disrupting bedding.
- 1304.1 -1307.25 Oil shale, with some siltstone - light to medium brownish gray; HCl - yes; earthy to satiny luster; faintly laminated with common streaked bedding; medium brown, analcitized, tuff at 1306.8.
- 1307.25-1313.05 Oil shale - medium brownish gray with some light brownish gray; HCl - yes; satiny luster; laminated with some streaked, common distorted, bedding, shaly parting throughout; light gray tuff bleb and flowage 1308.7; irregular, light gray, blebby tuff at 1309.45, distorting lower bedding; light colored zone 1309.6 - 1310.6; irregular tuff 1310.7 - 1310.8, load casted into lower bedding, slickensides at bottom of tuff at 1310.8; common crystal growths disrupting bedding 1311.0 - 1312.4; dolomitized (?) tuff at 1312.9.
- 1313.05-1315.1 Oil shale - medium brownish gray and medium greenish brown; HCl - minor; satiny luster; laminated with some streaked bedding; some interbedded silts from 1314.4 to bottom; shaly parting throughout.
- 1315.1 -1318.9 Siltstone, fine grained sandstone and some oil shale - light gray to light brownish gray with rare medium brownish gray;

- HCl - yes; chalky to earthy luster; lithologically laminated to laminated with common distorted bedding; oil shale becoming more common toward bottom; minor fracture 1315.2 - 1315.7; light gray tuff stringer at 1318.1.
- 1318.9 -1321.05 Oil shale with some siltstone - light to medium brownish gray; HCl - minor to yes; satiny with some earthy luster; laminated to faintly laminated with common streaked bedding. 1319.5 - 1320.0 Compressive Strength Sample.
- 1321.05-1328.2 Oil shale - medium to dark brownish gray with some light brownish gray; HCl - minor to yes; satiny to vitreous luster; laminated to faintly laminated with common streaked, rare distorted, bedding, shaly parting throughout; light colored zone 1324.0 - 1325.9; some tuff streaks and blebs 1324.0 - 1324.9; light brown tuff at 1326.65, mild distortion upper bedding. TOP "R-4".
- 1328.2 -1331.1 Oil shale - light to medium brownish gray with rare medium greenish brown; HCl - yes; earthy luster; laminated with common loop structures and distorted bedding; slump (?) zone 1329.9 - 1330.0.
- 1331.1 -1333.85 Oil shale - medium to dark brownish gray with some dark greenish brown; HCl - minor; satiny to vitreous luster; laminated with common streaked bedding; some streaks of analcitized tuffs to 1332.0; light colored band 1332.6; shaly parting throughout.
- 1333.85-1340.45 Oil shale - light, medium and dark brownish gray; HCl - minor; satiny to vitreous, with rare resinous luster; laminated to faintly laminated with common streaked bedding, shaly parting throughout; micro-faulting with minor offset, top to 1335.7; light colored bands throughout with some light greenish gray to 1335.0; lighter bands common at top, some at bottom. 1334.05 - 1334.55 Compressive Strength Sample.
- 1340.45-1346.25 Oil shale - medium to dark brownish gray and dark greenish brown with some light

brownish gray; HCl - no; satiny luster; laminated to faintly laminated, shaly parting throughout; irregular tuff stringer at 1346.05; light colored bands becoming common from 1343.9 to bottom. BOTTOM "R-4".

1346.25-1350.0

Marlstone and siltstone with some sandstone - medium greenish gray to light brownish gray and buff with some light gray; HCl - yes; satiny to chalky luster; laminated to lithologically laminated with common distorted bedding; top to 1347.6 predominantly marlstone with some interbedded silts; 1342.6 - 1347.6 has siltstone and sandstone; 1348.5 - bottom is marlstone and siltstone with some kerogen-rich zones; crystal growths 1348.5 and 1348.65, mildly distorting bedding; tight 5° fracture trace at 1348.7. 1346.6 - 1347.1 Compressive Strength Sample.

1350.0 -1352.55

Oil shale - light, medium and dark brownish gray with some medium greenish brown; HCl - minor; earthy to vitreous luster; laminated to 1350.45 with some streaked bedding; 1350.45 to bottom is laminated with highly contorted and distorted bedding caused by crystal growth and some slumpage; darker laminae contorted around lighter blebs and zones.

1352.55-1353.8

Oil shale - dark brownish gray; HCl - no; satiny luster; laminated to faintly laminated, shaly parting throughout; slickensides at 1353.3.

1353.8 -1357.9

Oil shale - light to medium greenish brown and medium brownish gray; HCl - minor; satiny luster; laminated to faintly laminated with common streaked bedding.

1357.9 -1359.85

Marlstone and siltstone - light to medium greenish gray and light gray; HCl - yes; chalky to earthy luster; faintly laminated with common streaked bedding; distortion of bedding by crystal growth at 1359.5, silty zones highly distorted above and below; some kerogen-rich laminae at bottom.

1359.85-1366.8

Oil shale - medium to dark brownish gray with some light brownish gray and medium greenish gray; HCl - no to minor; satiny with some earthy luster; laminated to faintly laminated, common loop structures to 1362.0 in leaner zone, common shaly parting; slickensides at 1361.8; zone of small tight fractures (?) at 1363.4 - 1363.5; two 30° fractures (?) 1364.15 and 1364.7; small tuff blebs 1365.0 - bottom.

1366.8 -1367.75

Siltstone - buff to light brownish gray; HCl - yes; chalky luster; massive with some kerogen-rich laminae; some tuff stringers throughout.

1367.75-1371.5

Oil shale - medium to dark brownish gray with rare light brownish gray; HCl - minor; satiny with rare vitreous luster; laminated to faintly laminated with common distorted bedding, bedding highly contorted by crystal growths 1369.5 - 1370.6; small tuff blebs at top.

1371.5 -1374.2

Marlstone and siltstone - medium greenish gray to light brownish gray and light gray; HCl - minor to yes; satiny to earthy luster; laminated to faintly laminated with common distorted bedding, around siltstone laminae.

1374.2 -1376.45

Oil shale - buff to light and medium brownish gray; HCl - yes; earthy luster; laminated with rare loop structures, common distorted and displaced bedding, microfaulting throughout.

1376.45-1377.2

Oil shale - medium to dark brownish gray; HCl - minor; satiny to vitreous luster; laminated to finely laminated with common streaked, rare distorted, bedding, shaly parting throughout; microfault at bottom with minor offset.

1377.2 -1381.25

Marlstone and oil shale - light to medium greenish gray, medium greenish brown, and medium brownish gray; HCl - minor to yes; satiny luster; laminated with common distorted bedding; irregular tuff stringer 1379.3; very thin, blebby tuffs at 1380.5, 1380.6 and 1380.9.

1381.25-1384.3

Oil shale - medium brownish gray to medium greenish brown; HCl - minor; satiny luster; faintly laminated to laminated with common streaked, distorted and displaced bedding; slickensides 1382.45 and 1383.2; irregular light gray tuffs 1383.4 and 1381.75; shaly parting throughout; some light gray tuff stringers 1383.0 to bottom.

1384.3 -1389.1

Oil shale - buff, to light and medium brownish gray with rare dark brownish gray; HCl - minor; earthy luster; faintly laminated with some laminations, common streaked and distorted bedding; bedding distorted by small crystal growths throughout; common, thin, analcitized tuff streaks and stringers throughout.

1389.1 -1391.35

Oil shale - medium to dark brownish gray; HCl - minor; satiny with rare vitreous luster; laminated with common streaked, some distorted bedding, shaly parting throughout; light gray tuff at 1389.4; irregular light gray tuff partially offset by microfault at 1390.0; some light gray tuff streaks, stringers and blebs throughout.

1391.35-1393.6

Oil shale - medium greenish brown to medium brownish gray; HCl - yes; satiny with some earthy luster; laminated with common streaked, some distorted bedding; pyrite and dolomite filling narrow cavity parallel to bedding at 1392.5.

1393.6 -1398.7

Siltstone with some oil shale - light gray to light brownish gray with rare medium brownish gray; HCl - yes; chalky to earthy luster; laminated with rare loop structures, common distorted bedding; rare light gray tuff streaks and stringers throughout.

1398.7 -1400.8

Oil shale - buff to light and dark brownish gray; HCl - minor to yes; earthy to satiny luster; laminated with some streaked, rare distorted bedding; tight fracture at 1399.6; some tuff streaks throughout; fractured at 1398.7.

1400.8 -1403.8

Oil shale - medium brownish gray to medium and dark greenish brown with rare light brownish gray; HCl - minor; satiny luster;

laminated with some streaked bedding; tight fractures 1401.15, 1401.3, 1402.2, 1403.0 - 1403.75; rare gilsonite and some light gray tuff streaks throughout.

1403.8 -1406.65

Oil shale and marlstone - light to medium brownish gray; HCl - minor; earthy to satiny luster; laminated to faintly laminated with some streaked and distorted bedding; some gilsonite streaks and blebs to 1404.5; fractured 1404.8 - 1405.1, minor breakage; wavy, irregular, vertical pyrite trace 1405.1 - 1405.5; some light gray tuff streaks 1405.3 - 1405.8; analcitized tuff stringers 1406.2 - bottom, offset by microfault at bottom; analcite (?) crystal growth at 1406.5, mildly distorting upper and lower bedding.

1406.65-1410.7

Marlstone with some oil shale - light to medium brownish gray and light greenish gray; HCl - minor; earthy to satiny luster; laminated with some streaked and distorted bedding, some shaly parting; tight fractures 1407.4 and 1407.9; analcitized tuffs with massive pyrite at 1409.15; pyrite stringers at 1409.55; some tuff stringers 1410.0 to bottom.

1410.7 -1429.35

Siltstone and fine-grained sandstone - light to medium gray and blue gray to light brownish gray; HCl - yes; chalky luster; lithologically laminated to banded, common distorted bedding; fracture trace at 1411.05; microfaulting with minor offset 1419.6; microfaulting 1420.4, 1421.8 and 1422.7; interbedded tuff stringers at 1425.6; buff-colored thin tuffs 1427.2, 1427.55 and 1427.7; wavy, buff-colored, blebby tuff at 1429.3, distorting upper and lower bedding; slump and flowage, 1426.5 - 1427.2; common crystal growths distorting bedding 1425.65 to bottom.

1429.35-1435.4

Marlstone, oil shale and siltstone - buff to light and medium brownish gray with some medium greenish gray; HCl - yes; chalky to earthy, with rare satiny luster; laminated with some loop structures, common distorted bedding; some interbedded tuff blebs at top; medium gray tuff stringers 1430.15 - 1430.35; thin, light to medium

gray tuffs 1430.9, 1431.35, 1432.3, 1432.35, 1433.5 and 1434.6; microfaulting with minor displacement 1432.0.

1435.4 -1440.25

Sandstone and siltstone - light to medium gray and light brownish gray; HCl - yes; chalky luster; lithologically laminated with highly distorted bedding; common turbidity features throughout.

1440.25-1443.05

Siltstone with some oil shale - buff with some light to medium brownish gray; HCl - yes; chalky luster; laminated to faintly laminated with common distorted bedding; some sandy blebs top to 1441.1; thin, irregular light gray tuff at 1441.65; some tuff streaks and stringers throughout.

1443.05-1443.65

Oil shale - dark brownish gray; HCl - minor; vitreous luster; laminated with distorted bedding at bottom, shaly parting throughout; thin, interbedded tuff at 1443.1; irregular, thin, tuff at bottom, distorting upper bedding.

1443.65-1445.6

Fine-grained sandstone and siltstone - light to medium gray and light brownish gray; HCl - yes; chalky luster; lithologically laminated with distorted bedding and turbidity features.

1445.6 -1453.35

Oil shale - medium, with some light, rare dark brownish gray, and some medium greenish gray; HCl - yes; earthy luster; faintly laminated to laminated with common streaked and distorted bedding, some interbedded siltstone top and bottom; rich zone 1447.7 - 1448.2; thin, dark gray, irregular tuff at 1451.25, load casted into lower bedding.

1453.35-1455.2

Siltstone - buff to light brownish gray with some light gray sand stringers; HCl - yes; chalky luster; banded to massive with common distorted bedding; minor fracture at 1453.65; bedding distorted upward by crystal growth at 1454.65; flowage features 1454.9 to bottom.

1455.2 -1457.75

Oil shale - light, medium and dark brownish gray; HCl - minor; earthy to satiny, with some vitreous luster; laminated with some streaked, rare distorted, bedding;

- microfaulting with minor offset at 1455.6; minor fracture from 1456.7 - 1457.25; breakage at bottom.
- 1457.75-1460.4 Oil shale - light to medium brownish gray; HCl - yes; earthy luster; laminated with common streaked and distorted bedding; fractured with slickensides at top of interval; some drilling breakage to 1459.2; microfaulting 1458.2; irregular light gray tuffs 1459.6 and 1459.75.
- 1460.4 -1462.3 Marlstone - light to medium greenish gray; HCl - yes; earthy luster; faintly laminated with common streaked bedding; some silty stringers, becoming common toward bottom.
- 1462.3 -1466.55 Siltstone with some fine-grained sandstone - light gray to light brownish gray; HCl - yes; chalky luster; banded to massive with common distorted bedding; buff-colored tuff top and 1465.5; broken up 1463.6 - 1463.8.
- 1466.55-1469.25 Oil shale - light to medium brownish gray with some dark brownish gray and medium greenish brown; HCl - minor; satiny luster; laminated with common streaked and distorted bedding; tuff (?) flowage along vertical fracture from 1467.45 - 1468.55, tuff layer originally at 1468.2; common light gray tuff and pyrite stringers 1468.6 to bottom.
- 1469.25-1481.5 Fine-grained sandstone and siltstone - light to medium gray and light brownish gray; HCl - yes; chalky luster; banded to massive with common lithologic laminations, highly distorted bedding; some tuff streaks and stringers to 1472.0; minor fracture 1473.7 - 1473.9, minor breakage; fractured from 1474.3 - 1477.0 fairly open with calcite filling, moderate breakage on fracture plane; some slumpage 1474.75 - 1477.2; buff-colored tuff distorting upper bedding at 1478.3.
- 1481.5 -1485.45 Marlstone and siltstone - light gray and light brownish gray; HCl - yes; chalky to earthy luster; faintly laminated with common streaked and distorted bedding; thin, medium brown tuffs 1482.0, 1482.1

and 1482.3; microfaulting with minor offset 1482.35 - 1482.7; slump feature at 1484.1; microfaulting 1484.35; irregular light gray tuff stringers 1485.0 and 1485.15.

1485.45-1493.5

Marlstone with some oil shale - light to medium brownish gray; HCl - minor to yes; earthy luster; laminated with common streaked and distorted bedding; medium brown, thin tuff at 1485.7; interbedded and microfaulted, buff to medium brown tuffs, 1489.15 - 1489.25; thin, irregular light gray tuff at 1493.1.

1493.5 -1500.8

Oil shale and marlstone - light to medium brownish gray with some dark greenish brown lower portion; HCl - minor; earthy luster; laminated with common distorted bedding; minor fracture at 1497.2; bedding distorted by crystal growth 1496.0 and 1499.0; pyrite filling of irregular vertical fracture (?) 1499.0 - 1499.1; common pyrite blebs and streaks 1499.1 to bottom; medium brown analcitized tuff at bottom, distorting lower bedding; possible very tight 20° fractures throughout interval.

1500.8 -1510.3

Siltstone with some oil shale - buff to light brownish gray and light gray, some dark brownish gray; earthy with some vitreous luster; laminated with common distorted bedding; interbedded, irregular, buff tuffs 1501.4; irregular, blebby, buff-colored tuff at 1501.9, distorting upper and lower bedding; interbedded tuff stringers 1503.65; irregular interbedded tuffs 1507.2; kerogen-rich zone 1507.95 - 1508.4; irregular analcitized tuff stringer 1508.15; slickensides at 1508.35; fractured 1509.9.

TOTAL DEPTH