

Also called Watson #4

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Skyline Oil Company's Skyline-Robertson No. 4 corehole drilled 320 feet S. of N. line and 1630 feet W. of E. line of sec. 22, T. 11 S., R. 25 E., Uintah County, Utah

Surface Elevation 6143.7 feet

Mahogany Marker 367.4

| From | To | Description |
|------|------|--|
| 0 | 20 | Not sampled. |
| 20 | 22.8 | Oil shale, lean to medium, light gray to dark gray, well defined bedding, poor banding. Bottom 0.4 foot light tan with a patch of red-brown which appears to be same as above except "bleached." |
| 22.8 | 23.7 | Tuff, white to tan, massive, slightly calcareous. |
| 23.7 | 29.0 | Oil shale, lean, tan to light gray, poorly defined bedding. Common pyrite, abundant specks of tan calcareous material parallel to bedding. A one-inch gray hard tuff bed at 25.1 feet, and a two-inch tan marlstone zone at 27.5 feet. |
| 29.0 | 31.2 | Marlstone, tan to light gray, massive. Calcite filled vertical fracture 29.0 to 30.0 feet. Common calcite cavities 29.5 to 30.0 feet. A 0.4-foot tan hard tuff bed at 30.2 feet. One-inch tan tuff injections at 31.0 feet. |
| 31.2 | 33.3 | Tuff, tan to buff, massive, very fine grained. Rare calcite filled cavities. |
| 33.3 | 34.3 | Marlstone, tan to light gray, massive. |
| 34.3 | 35.6 | Oil shale, lean to medium, dark gray, well defined bedding. A two-inch brown tuff bed at 35.3 feet. |
| 35.6 | 40.0 | Marlstone, tan to light gray, poorly defined bedding. Common specks of tan calcareous material. One-inch tan tuff beds at 38.1 and 39.4 feet. Rare calcite stringers. |
| 40.0 | 42.0 | Oil shale, lean, tan to light brown, poorly defined bedding. Abundant specks of tan calcareous material. One-half-inch gray tuff bed at 40.5 feet. Rare tuff stringers. |
| 42.0 | 43.2 | Oil shale, medium, dark gray, poorly defined bedding. Rare pyrite and tan tuff stringers. |
| 43.2 | 44.5 | Marlstone, tan, poorly defined bedding. Abundant calcareous specks. Sharp contact with tuff at bottom. |
| 44.5 | 50.8 | Tuff, white to light gray, massive, fine grained. Rare calcite filled cavities. Irregular contact at base. |
| 50.8 | 53.3 | Oil shale, lean, tan to brown, massive. Abundant irregular cavities filled with powdery calcite. Rare vertical fractures filled with powdery calcite. |

Illustration No. SBR-3107P

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Surface Elevation 6143.7 feet

| From | To | Description |
|-------|-------|---|
| 53.3 | 56.8 | Marlstone, tan to light gray, poor to well defined bedding. Abundant flakes of calcite. |
| 56.8 | 59.4 | Marlstone, tan, as above. Abundant patches of calcite up to one-quarter inch in diameter. A two-inch tan tuff bed at 57.5 feet. |
| 59.4 | 61.0 | Marlstone, tan to light gray, massive. Rare streaks of calcite. |
| 61.0 | 62.0 | Marlstone, tan, as above. Abundant patches of tan calcite up to one-quarter inch in diameter. |
| 62.0 | 67.0 | Oil shale, lean, brown, massive. Abundant large feathery patches of calcite and calcite filled cavities, rare bitumen in some cavities. |
| 67.0 | 69.2 | Marlstone, tan to brown, poorly defined bedding. Abundant calcite stringers parallel to bedding. |
| 69.2 | 70.0 | Oil shale, medium, dark brown, poorly defined bedding. Rare calcite stringers. |
| 70.0 | 76.0 | Oil shale, lean, tan to gray and brown, massive. Abundant feathery patches of calcite and calcite coatings on fracture. |
| 76.0 | 79.0 | Marlstone, tan to light brown, massive. Abundant white and tan patches of calcite. |
| 79.0 | 81.7 | Oil shale, lean, brown to dark gray, massive. Common specks of tan calcareous material. |
| 81.7 | 82.4 | Tuff, gray, massive. Common small calcite filled cavities. |
| 82.4 | 83.7 | Oil shale, lean to medium, brown to gray, massive. Rare specks of tan calcareous material. |
| 83.7 | 84.2 | Tuff, light gray, massive. Smooth contact at top, irregular at base. |
| 84.2 | 88.5 | Oil shale, medium, dark brown, massive to faintly bedded. Rare tuff stringers. |
| 88.5 | 89.7 | Oil shale, lean, tan to brown, massive. Bleached in places to lighter color. Common calcite crystals replacing shottite. Rare tuff stringers. |
| 89.7 | 90.0 | Tuff, tan to buff, massive. |
| 90.0 | 94.0 | Oil shale, medium, dark brown, massive to faintly bedded. Rare pyrite streaks. |
| 94.0 | 97.0 | Oil shale, lean, as above. A one-inch gray tuff bed at 96.0 feet. |
| 97.0 | 100.0 | Oil shale, lean to medium, brown to gray, poorly defined bedding. Rare calcite stringers. |
| 100.0 | 101.0 | Oil shale, lean, tan to brown, faintly bedded. |

Illustration No. SEM-3108P

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY

Core samples from Skyline Oil Company's Skyline-Robertson No. 4 corehole drilled 320 feet S. of N. line and 1630 feet W. of E. line of sec. 22, T. 11 S., R. 25 E., Uintah County, Utah (Con.)

Surface Elevation 6143.7 feet

| From | To | Description |
|-------|-------|--|
| 101.0 | 103.0 | Marlstone, tan to light brown, poorly defined bedding. |
| 103.0 | 112.0 | Oil shale, lean to medium, brown to gray, poorly defined bedding. Rare tan specks of calcareous material. |
| 112.0 | 128.8 | Oil shale, lean to medium, brown to gray, massive to poorly defined bedding. Rare pyrite streaks, rare tuff stringers. A two-inch tan tuff bed at 117.9 feet. |
| 128.8 | 130.0 | Oil shale, lean, tan to gray, well defined bedding. |
| 130.0 | 137.5 | Oil shale, lean to medium, brown to gray, massive to faintly bedded. Rare pyrite. |
| 137.5 | 139.0 | Oil shale, as above, banded with well defined bedding. |
| 139.0 | 157.5 | Oil shale, lean to medium, gray to brown, massive to poorly defined bedding, 0.5 foot of rich oil shale at 140.0 feet. Common pyrite stringers. |
| 157.5 | 158.1 | Oil shale, medium to rich, dark gray, massive. |
| 158.1 | 177.2 | Oil shale, lean to medium, gray to brown, poorly defined bedding. 0.4 foot rich oil shale at 163.9 feet. One-inch hard gray tuff bed at 169.2 feet. Common thin tuff stringers. 0.3-foot banded marlstone at 162.8 feet. |
| 177.2 | 178.0 | Oil shale, medium, dark gray, poorly defined bedding. A two-inch oil saturated tan tuff bed at 177.3 feet. |
| 178.0 | 190.0 | Oil shale, lean to medium, brown to gray, poorly defined bedding, vertical fracture 182.0 to 184.2 feet. A one-inch gray tuff bed at 185.9 feet. |
| 190.0 | 191.0 | Oil shale, medium, dark gray, poorly defined bedding. Rare oil saturated tuff stringers. |
| 191.0 | 200.0 | Oil shale, lean to medium, gray to brown, poorly defined bedding. Rare pyrite streaks. A one-inch tan oil saturated tuff bed at 195.2 feet. Vertical fracture in bottom one foot. |
| 200.0 | 202.1 | Oil shale, medium, brown, poorly defined bedding. |
| 202.1 | 207.4 | Oil shale, lean to medium, gray to brown, massive to faintly bedded. Vertical fractures in entire section. |

Illustration No. SM-3109F

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Core samples from Skyline Oil Company's Skyline-Robertson No. 4 corehole drilled 320 feet S. of N. line and 1630 feet W. of E. line of sec. 22, T. 11 S., R. 25 E., Uintah County, Utah (Con.)

Surface Elevation 6143.7 feet

| From | To | Description |
|-------|-------|---|
| 207.4 | 219.0 | Oil shale, medium, dark brown, poorly defined bedding, abundant stringers of oil saturated tuff. A two-inch tan oil saturated tuff at 207.5 feet. |
| 219.0 | 229.0 | Oil shale, medium to lean, gray to dark brown, poorly defined bedding. Common tuff stringers. One-inch gray tuff beds at 220.4 and 222.3 feet. Abundant specks of pyrite. Vertical fracture 223.5 to 227.0 feet. |
| 229.0 | 231.0 | Oil shale, medium, dark brown to gray, massive to poorly defined bedding. Rare oil saturated tuff stringers. |
| 231.0 | 238.0 | Oil shale, medium, dark gray to brown, poorly defined bedding. Rare tuff stringers. Common pyrite flakes. A one-half-inch oil saturated tuff bed at 235.9 feet. |
| 238.0 | 240.0 | Oil shale, lean, gray, poorly defined bedding. Common pyrite streaks. |
| 240.0 | 241.0 | Oil shale, medium, dark brown to dark gray, poorly defined bedding. A one-half-inch oil saturated tuff bed at 240.8 feet. |
| 241.0 | 267.9 | Oil shale, lean to medium, gray to brown, poorly defined bedding. Rare tuff stringers. Rare pyrite. 0.5-foot medium oil-shale zones at 244.5, 251.2, 257.9, and 262.8 feet. |
| 267.9 | 268.8 | Oil shale, rich, dark gray, massive, satiny luster. |
| 268.3 | 278.0 | Oil shale, lean to medium, gray to brown, poor to well defined bedding. Common tuff stringers. A one-inch brown oil saturated tuff at 268.9 feet, four-inch oil saturated tuff at 274.6 feet, one-inch brown-gray tuff at 276.2 feet. |
| 278.0 | 278.9 | Oil shale, medium to rich, dark gray, poorly defined bedding. A one-inch gray tuff at base. |
| 278.9 | 280.5 | Oil shale, lean to medium, gray to brown, poorly defined bedding. Rare pyrite. |
| 280.5 | 282.0 | Marlstone, gray, massive. |
| 282.0 | 292.0 | Oil shale, lean to medium, brown to gray, poor to well defined bedding. A two-inch oil saturated tuff at 285.8 feet, one-inch oil saturated tuff at 286.6 feet, 0.5-foot light gray fine grained tuff at 287.9 feet, two-inch gray dense tuff at 288.4 feet, two-inch gray, hard, very fine grained tuff at 290.4 feet. |

Illustration No. SRR-3110P

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Surface Elevation 6143.7 feet

| From | To | Description |
|----------------------------|-------|--|
| 292.0 | 313.5 | Oil shale, lean to medium, dark brown to gray, poorly defined bedding. A four-inch tan, slightly oil saturated tuff at 294.3 feet, common one-half inch or less oil saturated tuffs between 293 and 299 feet, two-inch oil saturated tuff at 300.1 feet, four-inch oil saturated tuff at 301.3 feet, one-inch oil saturated tuffs at 304.3 and 307.5 feet, vertical fractures at 302 to 303 feet. Rare pyrite stringers. |
| 313.5 | 315.4 | Oil shale, lean to medium, brown, poorly defined bedding. A one-inch oil saturated tuff at 314.9 feet. |
| 315.4 (Upper wavy bed) | 317.0 | Tuff, white to light gray, fine grained, massive. Very rare stringers of contorted oil shale, smooth to irregular contacts. |
| 317.0 | 330.0 | Oil shale, lean to medium, dark brown to gray, poor to well defined bedding. Common stringers of oil saturated tuff. Rare pyrite streaks. |
| 330.0 | 342.0 | Oil shale, lean to medium, dark brown and gray, poorly defined bedding, faint banding. Rich oil shale from 333.4 to 334.2 feet and 338.1 to 338.8 feet, rare tuff stringers. A three-inch rich bed of tuffaceous banded oil shale at 340.7 feet and one inch of same at 341.9 feet. |
| 342.0 (Top A-groove) | 343.8 | Marlstone, light gray, poor to well defined bedding, good banding in lower part. |
| 343.8 | 347.0 | Marlstone, tan to buff, massive to well defined bedding, rare bands of medium oil shale. |
| 347.0 (Bottom A-groove) | 350.6 | Marlstone, light gray, poorly defined bedding. Rare pyrite. |
| 350.6 | 352.8 | Oil shale, lean, light brown, massive to faintly bedded. Rare pyrite. |
| 352.8 | 354.0 | Oil shale, medium, dark gray, well defined bedding, poor banding. Rare tuff streaks. |
| 354.0 | 357.0 | Oil shale, lean to medium, gray to brown, well defined bedding, good banding in part. One-inch tan to gray tuff beds at 354.4 and 356.8 feet. |
| 357.0 | 360.3 | Oil shale, medium, dark gray to brown, well defined bedding. Abundant tuff stringers. A three-inch brown oil saturated tuff at 357.5 feet, two-inch oil saturated tuff at 358.1 feet. |

Illustration No. SER-3111P

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Surface Elevation 6143.7 feet

| From | To | Description |
|-----------------|-------|--|
| 360.3 | 361.5 | Oil shale, medium to rich, dark gray, massive to faintly bedded. Common less than one-half-inch tan tuff stringers. |
| 361.5 | 367.4 | Oil shale, lean to medium, brown to gray, poorly defined bedding. Rare tuff stringers. |
| 367.4 | 367.9 | Tuff, tan to light gray, speckled, fine grained. |
| Mahogany Marker | | Smooth contacts. |
| 367.9 | 370.5 | Oil shale, lean to medium, gray, poorly defined bedding. Rare pyrite. |
| 370.5 | 371.3 | Marlstone, tan to brown, well defined bedding, excellent banding. |
| 371.3 | 372.4 | Oil shale, rich, dark gray, massive, satiny luster. |
| 372.4 | 375.9 | Oil shale, lean to medium, brown to gray, poorly defined bedding. |
| 375.9 | 377.4 | Oil shale, medium, dark gray, poorly defined bedding. <u>A 0.5-foot contorted, light gray tuff at 306.1 feet, oil saturated in upper part and contains stringers of oil shale.</u> |
| 377.4 | 381.8 | Oil shale, rich, dark gray, poorly defined bedding, satiny luster in part. Rare tan tuff streaks. |
| 381.8 | 382.5 | Oil shale, medium, dark brown, poorly defined bedding. |
| 382.5 | 383.6 | Oil shale, rich, dark gray, massive. |
| 383.6 | 384.7 | Oil shale, medium, dark brown, poorly defined bedding. |
| 384.7 | 386.3 | Oil shale, medium to rich, dark gray to dark brown, poorly defined bedding. |
| 386.3 | 389.0 | Oil shale, medium, brown to gray, well defined bedding, good banding in part. |
| 389.0 | 391.0 | Oil shale, medium to rich, dark gray, poorly defined bedding. A one-inch tan tuff at 389.9 feet. |
| 391.0 | 396.6 | Oil shale, lean to medium, brown, well defined bedding. Abundant thin tuff stringers, some oil saturated. Good banding in part. 0.6-foot rich oil-shale zones at 302.3 feet, 304.7 feet, and 305.9 feet. |
| 396.6 | 400.0 | Marlstone, tan to brown, well defined bedding, excellent banding. |
| 400.0 | 401.3 | Oil shale, medium, dark brown, massive, tuffaceous in part. |
| 401.3 | 403.0 | Oil shale, medium, brown, well defined bedding. |

Illustration No. SBR-3112P

early bed
destroyed
by turn

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Surface Elevation 6143.7 feet

| From | To | Description |
|-------------------------------|-------|---|
| 403.0 | 404.0 | Oil shale, medium, brown, poorly defined bedding. |
| 404.0 | 407.6 | Oil shale, lean to medium, brown to gray, poorly defined bedding. Rare pyrite streaks. 0.4-foot rich oil shale at 406.4 feet. |
| 407.6 | 410.5 | Marlstone, tan to light gray, massive to well defined bedding, excellent banding in part. |
| 410.5 | 413.5 | Oil shale, lean to medium, tan to brown-gray, well defined bedding, good banding. A 0.4-foot dark gray oil saturated tuff at 412.0 feet. Rare tuff streaks. <i>Fred bed</i> |
| 413.5 | 414.0 | Oil shale, medium, dark brown, well defined bedding. Tuffaceous "cork-like" zone. |
| 414.0 | 416.1 | Marlstone, brown to gray, well defined bedding, poor banding. Two inches of medium oil shale at 414.4 feet. |
| 416.1 | 417.4 | Oil shale, medium, gray to brown, well defined bedding, poor banding. Tuffaceous zone at 417.0 feet. |
| 417.4 | 419.8 | Marlstone, tan to brown, well defined bedding, poor banding. |
| 419.8 | 420.8 | Oil shale, lean to medium, brown to gray, well defined bedding, poor banding. |
| 420.8 | 422.1 | Tuff, dark brown, medium grained, massive. Common contorted stringers of lean oil shale. Oil saturated. |
| (Lower wavy bed) Curly bed | | |
| 422.1 | 425.8 | Oil shale, lean, brown to gray, well defined bedding, good banding. Common bands of medium oil shale. |
| 425.8 | | Bottom of core. |

X-ray Identifications:

118.9 Calcite (probably replacing shortite).

Illustration No. SER-3113P

Laramie Petroleum Research Center, Laramie, Wyoming

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