

LITHOLOGIC DESCRIPTION OF SAMPLES SUBMITTED FOR ASSAY^{1/}

Core samples from U.S. Bureau of Mines Wyoming Corehole No. 4 drilled in 1972 in NE1/4NW1/4 (329 feet S of N line and 1,920 feet E of W line) of sec 33, T 24 N, R 107 W, Sweetwater County, Wyoming

Surface elevation: 6,501 feet
Cored interval: 325.0 to 446.5 feet

From	To	Description
LANEY MEMBER OF GREEN RIVER FORMATION		
325.0	329.4	Oil shale: Dark to medium and rare light grayish-brown. Faintly to distinctly laminated. Regular thick to thin parting. A 1-inch gray silty tuff band at 328.4; few thin to fine wavy tuff layers in 2 inches below band.
329.4	330.4	Oil shale: Dark to rare light brownish-gray. Faint to some distinct laminae. Regular thick to thin parting.
330.4	331.4	Oil shale: Medium to some light and dark brownish-gray. Moderately distinct to faint laminae. Regular thick to thin parting. Rare fine blebby gray analcite laminae.
331.4	332.5	Oil shale: Dark brownish to slightly olive gray. Faint very fine laminae. Regular thick to thin parting; hackly fracture. Rare fine gray silty laminae. Few small light gray chalcedony nodules at 332.1. Rare dark brownish-gray coprolites.
332.5	333.8	Oil shale: Dark to some medium brownish-gray and brown. Faint very fine laminae. Regular thick to thin parting; hackly fracture. A thin gray silty tuff band at 333.6.
333.8	334.9	Missing.
334.9	338.3	Oil shale: Dark brownish to slightly olive gray. Faint very fine laminae and streaked bedding. Regular thick to thin parting. A fine dark grayish-brown blebby analcite lamina at 336.5.
338.3	339.5	Oil shale: Dark to rare medium brownish-gray and grayish-brown. Faint to rare distinct laminae. Regular thick to thin parting. Abundant fine dense gray laminae and rare fine brown silty tuff streaks from 339.0 to 339.3. Medium to dark gray silty tuff with some fine black oil-shale streaks in lower 0.2 foot.
339.5	339.9	Missing.
339.9	341.0	Oil shale: Dark to medium grayish-brown and brownish-gray; some tan to buff in upper 0.3 foot. Faint very fine laminae; abundant very fine distinct tan to buff earthy laminae and streaks in upper 0.3 foot. Regular thick to thin parting; some papery parting near top.
341.0	341.7	Tuff: Brownish-gray, silty. Abundant fine to thin wavy to regular dark oil-shale streaks and layers in upper 0.2 foot. Sharp smooth contact with oil shale below.

^{1/} By L. G. Trudell, completed February 12, 1973

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Laramie Energy Research Center, Laramie, Wyoming

May 16, 1973

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From	To	Description
341.7	342.9	Oil shale: Dark brownish-gray in upper part to grayish-brown and tan in lower part. Faint to some moderately distinct very fine laminae. Regular thick to some thin parting. A very thin light brownish-gray very fine sandy-textured tuff lamina at 341.8. A 0.2-foot gray silty tuff band at 342.5. Abundant ostracods in lower 0.3 foot.
342.9	343.1	Oil shale: Very dark brownish-gray to black. Very faint laminae and streaked bedding. Regular thick to thin parting. A very fine buff blebby biotitic tuff lamina at 343.0. Some very fine dense brown blebs and streaks in lower part. Sharp regular contacts at top and bottom.
TOP OF WILKINS PEAK MEMBER		
343.1	343.3	Tuff: Light brownish-gray. Silty to very fine sandy textured. Very abundant biotite in lower part. Two light gray silty biotitic tuff laminae separated by fine oil-shale laminae at base.
343.3	346.2	Oil shale: Medium to some light olive and olive gray. Faint streak bedding and some laminae. Regular to irregular thick to some medium parting; slightly irregular to conchoidal fracture.
346.2	347.2	Oil shale: Medium to light and some dark olive and grayish-brown. Faint to some distinct streaked bedding and some very fine to thin laminae. Irregular to regular thick to medium parting.
347.2	348.2	Oil shale: Medium to dark olive and grayish-brown. Faint to moderately distinct streaked bedding. Irregular to regular, thick to thin parting.
348.2	349.0	Oil shale: Medium to some light and dark grayish-brown. Faint to distinct very fine slightly crinkly laminae. Regular thick to thin parting. Some ostracods.
349.0	349.2	Oil shale: Dark brownish and slightly olive gray to some black. Faint very fine laminae and streaked bedding. Abundant very fine pyrite blebs and streaks.
349.2	350.2	Oil shale: Tan to medium and rare dark grayish-brown, buff marlstone in lower 0.2 foot. Moderately distinct to faint streaked bedding; some fairly distinct to faint laminae in lower part. Irregular thick to medium parting. A thin wavy buff very fine-grained crystalline streak at top.
350.2	350.7	Missing.
350.7	351.7	Oil shale: Dark and some medium brownish-gray to black. Moderately distinct to very faint streaked bedding. Irregular

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From	To	Description
		to fairly regular thick to thin parting; rubble with some buff marlstone and dense light brownish-gray dolomite at top. Some disseminated pyrite. Some fine disseminated crystals and crystalline streaks. A thin silty to very fine sandy-textured light brownish-gray tuff at 351.5. Uneven sample split.
351.7	352.9	Oil shale: Dark brownish-gray to black. Faint streaked bedding. Irregular thick parting. Fairly abundant very irregular fine crystalline streaks and stringers in upper part. Tan to buff-white slightly silty and earthy tuff with abundant fine to thin wavy black oil-shale streaks and stringers at 352.3-352.5.
352.9	354.0	Oil shale: Medium to some dark and light olive green. Faint to distinct streaked bedding. Abundant fine disseminated crystals in upper 0.3 foot.
354.0	355.0	Oil shale: Tan and grayish-brown in upper part to light and medium olive gray in lower part. Faint to distinct irregular bands and laminae. Abundant fine to thin buff to light gray silty-textured calcite streaks and layers.
355.0	364.1	Marlstone: Medium to some light and rare dark slightly olive and brownish-gray. Faintly streaked to faintly banded and laminated. Abundant moderately coarse to fine calcite crystals. Fairly abundant pyrite. (359.0-361.4 missing)
364.1	367.8	Oil shale: Olive green and some olive gray. Faint streaked bedding. Very abundant moderately coarse disseminated calcite crystals. A $\frac{1}{2}$ -inch light gray slightly silty pyritic tuff (?) stringer at 364.7.
367.8	368.8	Oil shale: Medium olive gray. Faint streaked bedding. Abundant very fine disseminated pyrite in some zones. A $\frac{1}{2}$ -inch tan to brown wavy algal layer at top. Some crystalline patches and streaks near top and bottom.
368.8	369.8	Oil shale: Medium to some dark olive gray. Faint to moderately distinct streaks and laminae. Abundant very fine disseminated pyrite. Abundant fine to thin yellowish to brownish fine-grained crystalline streaks.
369.8	371.1	Oil shale: Medium and rare dark olive gray. Moderately distinct to faint streaked bedding. Some very fine pyrite.
371.1	372.0	Marlstone: Medium to some light slightly olive gray. Faint streaked bedding. Abundant very fine disseminated pyrite (and pyrrhotite?). Light brownish-gray fine-grained limestone with some fine marlstone streaks and stringers at 371.2-371.4.

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From	To	Description
372.0	373.6	Oil shale: Medium to some light and dark olive green to olive gray. Moderately distinct to faint streaked bedding. Abundant fine gray-buff crystalline streaks in upper half foot. A very thin tan biotitic tuff layer near top.
373.6	375.7	Oil shale: Medium to dark olive gray. Faint streaked bedding. Very abundant buff to brownish fine-grained crystalline blebs, patches, and streaks. A thin pinched-out silty tuff at 374.8.
375.7	377.0	Oil shale: Light to medium olive gray and grayish-brown. Faintly streaked and laminated to nearly massive.
377.0	377.7	Oil shale: Medium and some light slightly olive gray. Faint streaked bedding. Abundant very fine disseminated pyrite.
377.7	378.3	Missing.
378.3	379.6	Marlstone: Medium to light greenish to olive gray. Faint streaked bedding and some thin laminae. Abundant very fine disseminated pyrite (and pyrrhotite?). Broken pieces of yellowish-buff earthy tuff (?) at top. Sample of buff earthy tuff (?) from 378.4 feet: X-ray-K feldspar.
379.6	383.1	Oil shale: Medium to very dark olive gray, some light olive gray in upper part. Fairly distinct to faint streaked bedding. Very abundant slightly brownish fine to medium-grained crystalline blebs, patches, and streaks.
383.1	384.4	Oil shale: Medium to rare dark and light olive gray. Faint to moderately distinct streaked bedding. Abundant crystals as above down to 384.0.
384.4	386.5	Oil shale: Medium and very rare dark olive gray to slightly greenish-gray. Faint streaked bedding. Rare fine-grained crystalline streaks in upper part. A 2-inch light brownish-gray silty calcareous tuff stringer at 385.7.
386.5	388.3	Oil shale: Medium to rare dark brownish-gray and olive gray. Faint streaked bedding and laminae. A thin irregular very dark gray silty layer at 388.2 with fine vermiform stringers extending into shale below.
388.3	389.4	Oil shale: Medium to some dark brownish-gray and olive gray. Faintly laminated and streaked. Rare fine to thin dense grayish-brown dolomite streaks.
389.4	391.6	Marlstone: Medium to light slightly brownish and olive gray. Faintly laminated and banded. Some fine massive pyrite blebs and streaks.

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From	To	Description
391.6	392.5	Oil shale: Medium to rare light and dark brownish-gray and olive gray. Moderately distinct to faint regular to distorted laminae and streaks. Some fine pyrite blebs in upper part. Two thin irregular very dark gray silty stringers at 392.0-392.1.
392.5	393.4	Oil shale: Dark to medium brownish-gray and olive gray. Faintly laminated.
393.4	393.9	Oil shale: Medium and very rare dark olive gray. Faint streaked bedding. Abundant fine to moderately coarse calcite crystals in lower inch.
393.9	394.1	Marlstone: Medium to light slightly brownish-gray and some gray buff. Faintly laminated. Abundant fine calcite crystals and pyrite. A very thin buff earthy and silty tuff (?) stringer at top.
394.1	394.3	Tuff: Very light buff, massive, earthy and silty. Sharp regular contacts.
394.3	396.6	Sample of buff tuff from 394.2 feet: X-ray-K feldspar. Marlstone: Medium to light almost neutral to olive gray and tan to rare medium and dark brownish-gray. Faint to some distinct thick to thin bands and laminae. Abundant medium to fine gray to brown silty limestone layers in lower part.
396.6	397.8	Oil shale: Dark and some medium brownish-gray to black. Faint streaked bedding; some distinct grayish-brown to tan streaks, stringers, and lenses. Very abundant fairly coarse disseminated calcite crystals. Rare small biotitic tuff nodules.
397.8	398.2	Tuff: Buff to tan, silty and earthy. Massive with rare fine dark oil-shale stringers. Irregular worn and broken core pieces; uneven sample split.
398.2	398.5	Sample tan to buff tuff fragments: X-ray-K feldspar. Oil shale: Dark brownish-gray to black. Faint streaked bedding. Abundant calcite crystals.
398.5	399.0	Oil shale: Olive gray to olive green. Faint streaked bedding. Abundant disseminated calcite crystals and small crystalline patches.
399.0	401.5	Oil shale and marlstone: Medium to light olive gray and olive green; some yellowish-buff to tan and rare brown in lower part. Faint to moderately distinct streaked bedding and some faint bands and laminae. Rare calcite streaks in upper part. Some fine lacy dense gray pyritic chert stringers at 401.2-401.4.

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From	To	Description
401.5	403.0	Oil shale: Medium to light greenish-gray and olive gray. Faint streaked bedding. Abundant crystalline calcite; small orange-tan fine-grained patches and streaks in upper part grading to fairly coarse slightly greenish crystals in lower part. Some very thin contorted and broken buff to gray wavy algal stringers near base. Sample of oil shale with abundant calcite crystals from 402.4 feet: X-ray - dolomite, calcite, quartz, feldspar.
403.0	406.0	Marlstone: Medium to light slightly olive and brownish-gray in upper part to light gray in lower part. Faintly streaked to very faintly banded and laminated. Coarse calcite patches and layers becoming abundant below 403.7; thick crumbly broken crystalline layer in lower 0.2 foot.
406.0	406.8	Oil shale: Black to dark grayish-brown. Faint streaked bedding with abundant fine crystalline calcite blebs and streaks down to 406.5; faint very fine regular laminae in lower part.
406.8	407.6	Oil shale: Medium to rare light brownish-gray and olive gray. Very faintly laminated. Some coarse calcite patches in lower half.
407.6	408.8	Marlstone: Medium to light olive and greenish-gray to light almost neutral gray in lower part. Faintly streaked to laminated and banded. Abundant coarse calcite patches in upper part; some very fine lacy streaks in lower part. A thin buff biotitic tuff layer at 407.7.
408.8	409.5	Oil shale: Medium and very rare dark olive gray to brownish-gray. Faint laminae and streaked bedding. A very thin wavy buff silty tuff (?) layer at 409.0.
409.5	411.3	Oil shale: Dark and some medium brownish-gray to black. Moderately distinct to very faint streaked bedding and some laminae. Rare fine dense brown dolomite streaks and laminae. Few fine discontinuous irregular calcite-filled fractures at 409.9-410.1.
411.3	411.7	Layered tuff: Buff and yellowish-tan to slightly brownish-gray. Distinctly laminated and banded. Layers in upper half grade from dense light mudstone at top to darker siltstone at base; mudstone laced with very fine dark silty fracture fillings.
411.7	412.0	Oil shale: Like 409.5 to 411.3. Thin irregular dense light brownish-gray lenses and buff tuff stringers at top.

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From	To	Description
412.0	412.6	Oil shale: Medium and rare dark brownish-gray to olive gray. Faintly laminated and streaked. Rare fine crystalline calcite stringers with pyrite.
412.6	414.2	Oil shale and marlstone: Medium to light olive to greenish-gray. Faintly streaked to laminated and banded. Abundant fine lacy calcite stringers concentrated in thick zones.
414.2	416.0	Marlstone: Light to medium gray and slightly brownish-gray. Faintly banded and laminated. Some fine to thin, silty to sandy-textured commonly pyritic streaks and layers.
416.0	416.6	Marlstone and oil shale: Tan and some buff to medium and rare dark brownish-gray. Faint to some distinct laminae and rare bands. Abundant fine-grained crystalline blebs, streaks, and zones. A 1-inch gray-buff to gray biotitic tuff at 416.5.
416.6	417.7	Oil shale: Brown to dark brownish-gray and rare black. Distinct fine to thin irregular streaks; contorted bedding near top. Thick wavy olive-gray silty biotitic tuff at 417.4.
417.7	419.3	Oil shale: Olive gray to olive green. Faint streaked bedding and some laminae. Rare very fine silty biotitic streaks in upper part.
419.3	420.5	Marlstone: Light to medium slightly olive to neutral gray. Faint to some moderately distinct laminae and bands. Abundant fine to thin silty to sandy gray-buff calcareous streaks and layers in lower part.
420.5	421.0	Marlstone: Light to rare medium brownish to slightly olive gray. Faint laminae and streaked bedding. Abundant fine to thin dense to silty-crystalline blebs, streaks, and layers in lower part. Rare very thin buff marlstone inclusions. Some rubble; length uncertain.
421.0	422.7	Oil shale: Dark brownish-gray to black, some medium brownish-gray and olive gray in lower part. Faint to distinct streaked bedding; distorted to wavy in upper part. Abundant fine to small brown blebs, lenses, and streaks in upper part. Abundant moderately coarse crystals in lower part.
422.7	423.2	Oil shale: Grayish-brown and olive green. Faint to fairly distinct streaked bedding. Abundant fairly coarse crystals and fine-grained crystalline streaks.
423.2	424.2	Marlstone: Olive green to buff. Faintly streaked and laminated. Some fine gray crystalline streaks near top.

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From	To	Description
424.2	424.6	Marlstone and mudstone: Light to medium gray and light olive gray to buff. Faint to distinct thin laminae and bands. Abundant fine to thin silty to sandy-textured calcareous streaks and layers.
424.6	425.7	Marlstone: Buff and gray buff to rare medium olive gray. Moderately distinct to faint bands and laminae. Some thin dark olive-gray to black oil-shale layers in upper part. Abundant fine crystals concentrated in fine to thin zones in lower part.
425.7	426.8	Marlstone: Light to medium slightly greenish-gray. Faintly streaked and laminated to massive. Abundant fine to moderately coarse crystals and crystalline streaks.
426.8	429.6	Oil shale: Dark and some medium grayish-brown, some black satiny oil shale in middle part. Faint commonly distorted streaked bedding with abundant fine distinct tan to buff streaks and stringers in some parts. Abundant fine to coarse crystals.
429.6	430.9	Oil shale: Olive gray to olive green to slightly greenish-gray. Faint streaked bedding; becoming thinly banded in lower part. Abundant moderately coarse to fine crystalline blebs, patches, and streaks.
430.9	431.9	Marlstone: Medium to light gray, slightly silty in parts. Faintly streaked to laminated; fine to $\frac{1}{4}$ -inch white to buff marlstone layers in lower 0.2 foot. Some crystalline patches near top.
431.9	435.4	Oil shale: Medium to dark olive gray and brownish-gray. Faint streaked bedding. Abundant fine to coarse crystalline streaks, patches, and blebs.
435.4	435.9	Oil shale: Olive gray to slightly greenish-gray. Faint streaked bedding and thin laminae. Abundant moderately coarse crystals.
435.9	436.6	Mudstone: Slightly orangish-buff to gray buff and light gray. Faint to some moderately distinct streaks and laminae. A 0.1-foot brownish-gray to light and medium gray biotitic tuff band at 436.3.
		Sample of buff to light gray mudstone from 436.1 feet: X-ray - quartz, dolomite, K feldspar.
436.6	437.2	Mudstone and marlstone: Gray buff to light and some medium slightly olive to neutral gray. Faint to fairly distinct laminae and bands. Abundant fine to thin, moderately coarse to fine sandy-textured crystalline layers and streaks. Uneven sample split.

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From	To	Description
437.2	439.3	Oil shale: Medium to very dark grayish-brown and rare black. Distinct to faint streaked bedding; abundant fine to thin brown to tan streaks and stringers in upper part. Abundant crystalline patches and blebs. Sample of oil shale with very abundant crystals from 438.0 feet: X-ray - calcite, dolomite, quartz, feldspar.
439.3	440.3	Oil shale: Olive green, some medium to rare dark olive gray and brownish-gray in upper part. Faint streaked bedding. Abundant fairly coarse to fine crystals.
440.3	440.8	Marlstone: Light slightly greenish-gray to gray buff. Faintly laminated to streaked. Rare crystals in upper part.
440.8	441.2	Rubble: Mostly oil shale as below. Some small massive brown fine-grained crystalline fragments. Some tan to buff very biotitic tuff fragments. Grab sampled.
441.2	441.3	Missing?
441.3	442.1	Oil shale: Medium and some light to rare dark olive gray. Faint streaked bedding with rare moderately distinct laminae. Abundant moderately coarse crystals.
442.1	443.0	Oil shale: Medium to some dark brownish-gray and olive gray. Faint to fairly distinct streaked bedding and some discontinuous laminae. Abundant moderately coarse to fine crystals. Rare small brown biotitic tuff lenses in upper part.
443.0	444.8	Marlstone: Medium to light slightly greenish to neutral gray. Faintly streaked to laminated and banded. Abundant crystals becoming concentrated in fine to thin layers in lower part. Algal breccia at 444.6-444.7.
444.8	446.0	Oil shale: Medium and rare dark olive gray and brownish-gray to some tan and buff. Distinct streaked bedding. Abundant moderately coarse to fine disseminated crystals and crystalline streaks and blebs.
446.0	446.5	Main tuff (incomplete?): Yellowish-buff. Massive; few faint laminae in upper part. Abundant very fine black specks (biotite in part).
Bottom of core.		

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