Lithological Description of Drill Core Peterson Trust #8-31 Lyon County, Kansas

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and Olivia Jones
Kansas Geological Survey

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Subject: Lithological Description of drill core Peterson Trust #8-31 August 1, 2025

Location: Lyon County, Kansas
Lat/long: 38.611426, -96.347335
Archival location: Kansas Geological Survey

This memo provides a detailed lithological description and photographic documentation of drill core Peterson Trust #8-31, spanning footages 2330.0' and 2424.49' (boxes 1-20). This core was described as part of the U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM)'s Carbon Ore, Rare Earth and Critical Minerals (CORE-CM) Initiative for U.S. Basins (DE-FOA-0002364). The core was selected to evaluate Pennsylvanian strata in support of critical mineral potential, coal-related stratigraphy, and carbon ore systems in the Midcontinent. Core Peterson Trust #8-31was measured by core librarian Olivia Jones, described by KGS Assistant Scientist Dr. Stephan Oborny, and contributes to the geologic and geochemical characterization of the Cherokee-Forest City Basin.

Peterson Trust #8-31 Lithological Description and Details

Core Barrel 1 (2330-2360)

2330'-2331' Calcareous silty shale, rhizoliths, weak reaction to HCL
2331'-2331.5' Reworked intraclasts, brecciated
2331.5'-2332.5' Calcareous shale, dark gray-to-black (black in bottom). Brachiopod packstone in lower 6" with base bacterial and glauconitic.
2332.5'-~2334.5' Lime w/ brachiopods common. Algal mats in middle part.
~2334.5' through to 2352' is predominantly non-marine. No HCL reaction for most of the sections unless noted below.
~2334.5'-2340.5' Thin interbeds like below but finer grained. Rhizolitic.
2340.5'-2342' vf sand w/some burrowing and rhizoliths
2342'-2343.75' bedded argillic shale / fine silt w/ rhizoliths. No reaction to HCL
2343.75'-2346.25' fossiliferous and weakly marled black silty shale. Basal 5" is lime dominated calc shale
2346.25'-2346.55' Coal
2346.55'-2351.55' No reaction to HCL, silty shale, gray-green color w some burrowing. Rhizoliths in upper 6"
2351.55'-2352' Septarian veining, hard like limestone, could biogenetic
2352'-2352.75' Moderate Coal
2352.75'-2353.2' Reworked lime with coal
2353.2'-2358.2' calcareous shale, greenish-to-tan in color, Ostracoda @ 2354.9'

Core Barrel 2 (2360-2390)

2358.2'-2364.65' No reaction to HCL, siltstone, fossiliferous throughout with some lime marling on multi-inch scale. Brachiopoda, and crinoids observed. Very dark in color.
2364.65'-2366.9' Well-developed coal w/ black shale @ 2365.9'-2366.1'
2366.9'-2369' Black calcareous shale w/ laminar flows/drapes
2369'-2370.15' Fossiliferous calcareous shale, transgressive, like an argillaceous packstone
2370.15'-2371.05' Well-developed coal
Crumble Zone 2371'-2379.5' (10' of box containing ~8.5' of core)

2371.05’-2376.75’ Highly fractured. Predominantly silty lime in upper foot. Below the upper foot is an argillic calcareous silty shale.
2376.75’-2377.25’ Well-developed coal
2377.25’-~2377.6’ Reworked contact zone.
~2377.6’-2379.55’ In lower part of crumble zone, interval primarily contains fractured silty limestone. Looks like there is an ~2” black shale parting in the middle of the crumble zone.
2379.55’-2380.2’ Coal
2380.2’-2380.8’ Calcareous Shale
2380.8’-2381’ Coal
2381’-2381.6’ Calcareous Shale
2381.6’-2382’ Coal
2382’-2382.45’ Very hard calcareous shale w/ coal stringers
2382.45’-2383.4’ Well-developed coal
2383.4’-2386.3’ Tan-to-greenish wackestone, rhizoliths and argillic in upper foot. The lower foot is dark in color and pyritic.
2386.3’-2388.5’ Well-developed coal
2388.5’-2388.65’ Gray Shale
2388.65’-2391’ Tan wackestone, above 2390’ blockier, below 2390’ more flaggy

Core Barrel 3 (2390-2420)

2391’-2397.2’ Dark gray-to-black shale, below 2393’ dominated by thin laminar flows, above 2393’ dominated by lenticular bedding.
2397.2’-~2398.2’ Within crumble zone. Tan wackestone occupies ~3.4’ in boxes but is likely 1.1’ of fragmented lime. Upper contact is sharp and burrowed. Lower contact is gradational.
Crumble Zone 2397.2’-~2378.3’ (~3.4’ of box containing ~1.1’ of core)
~2398.2’-2401.15’ Black Shale. More calcareous above 2399’. More argillic below 2399’.
2401.15’-2403.85’ Well-developed coal
2403.85’-2405.6’ Calcareous silt-to-silty lime; 2403.85’-2404.9’ More argillic w/ rhizoliths; 2404.9’-2405.6’ Contains bacterial mats and chert in lower 4”
2405.6’-2407.75’ Well-developed coal
2407.75’-2412.65’ Predominantly Wackestone; 2407.75’-2409’ Dark in color, reworked, argillic w/ some fossil debris; 2409’-2412.55’ potential rhizoliths in upper 6”
2412.65’-2413.7’ Well-developed coal
2413.7’-2420.3’ Tan wackestone with black shale partings between 2419.15’-2419.4’

Core Barrel 4 (2420-2449)

2420.3’-2423.7’ Predominantly shale. Gradational color from top to bottom. Grayed down to around 2421.5’ then it turns black. Slightly calcareous between 2421.5’ and 2422.4’. Pyritized burrows and fossils are common. Bryozoans, crinoids, and brachiopods are noted in lower foot. Pyritized horizontal burrows elsewhere throughout the interval. 2423.25’-2423.4’ appears to be a siltstone flow from nearby. It is hard to evaluate here in core but does have silty texture to touch.
2423.7’-2424.4’ Reworked. Lots of lime intraclasts, silt, and black shale. Pyritic. Basal contact is notable. True cycle boundary at 2424.4’.
2424.4’-2426.6’ Silty lime(?)
2426.6’-2427.55’ Argillic lime
2427.55’-2430.3’ Brown shale w/ black banding (prominent between 2428.7’-2429’)
2430.3’-2431.5’ Fine burrowed sand-to-silt w/ lime intraclasts in lower 0.5’
2431.5’-2432.25’ Argillic wackestone
2432.25’-2433’ Black shale; no siderite, no PO^4
2433’-2433.5’ Fractured silicified limestone in plastic bag
2433.5’-2437.55’ Very calcareous black shale, hard, silty

2437.55’-2442.7’ Stacked package of marine flows nearly horizontal at top. The bottom flows are at a high angle of ~40 deg dip. Varying size of lime intraclasts (≤3cm) are observed. Flows are interbedded with reworked black shale. We do not observe black shale within the Mississippian succession in this part of the basin, but they are very common in the Pennsylvanian succession. It is interpreted here that the black shale was sourced from the Penn succession.

2442.7’-2448’ Fine sand-to-silt with lime intraclasts up to cobble stone size. Rugose coral is visible in cobbles.

~2448’-2449’ (base of core) Mississippian lime. Micritic, moldic in part, rugose coral observed on core break.

Two potential horizons for Mississippian-Pennsylvanian Subsystem boundary (2442.7’ and 2448’). Favor boundary position of 2448’. 2442.7’-2448’ is likely Mississippian chat, or reworked Mississippian immediately above the subsystem boundary.

Peterson Trust #8-31 Drill Core Photos

Images are in order from box 1 through box 20.


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KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2336'
2335'
2334.7'
2338'
2337'
2340.8'
2340'
2339'


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KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2340.8'
2342'
2341'
2345'
2344'
2343'
2347.1'
Spacer
2347.1'
2347'
2346'


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KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
Popular Mechanics
2347.1'
2349'
2348'
2350'
2353.6'
2353'
2352'


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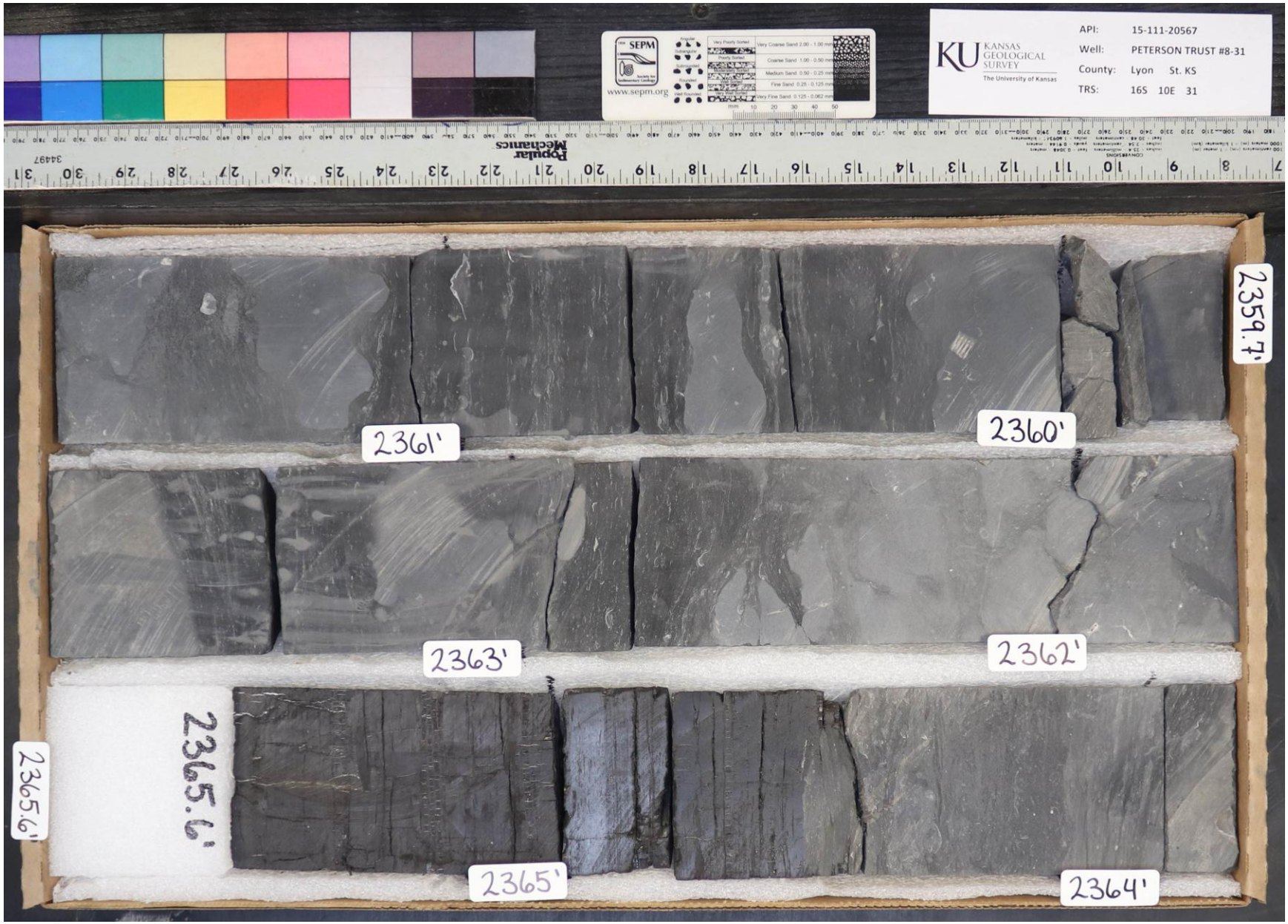
KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2353.6'
2355'
2354'
2357'
2356'
2359.7'
2359'
2358'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KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2359.7'
2360'
2361'
2362'
2363'
2364'
2365'
2365.6'


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Well: PETERSON TRUST #8-31
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TRS: 16S 10E 31
2365.6'
2367'
2366'
2369'
2368'
2371.7'
2371'
2370'


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KU KANSAS GEOLOGICAL SURVEY
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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
Popular Mechanics
2371.7'
2372'
2374'
2376'
~2378'


KU KANSAS GEOLOGICAL SURVEY
The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
SEPM
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Popular Mechanics
(Left too much room for crumble zone)
Spacer
2379.6'
~2378'
2379'
2381'
2380'
2379.6' END CRUMBLE ZONE
2383.8'
2383'
2382'


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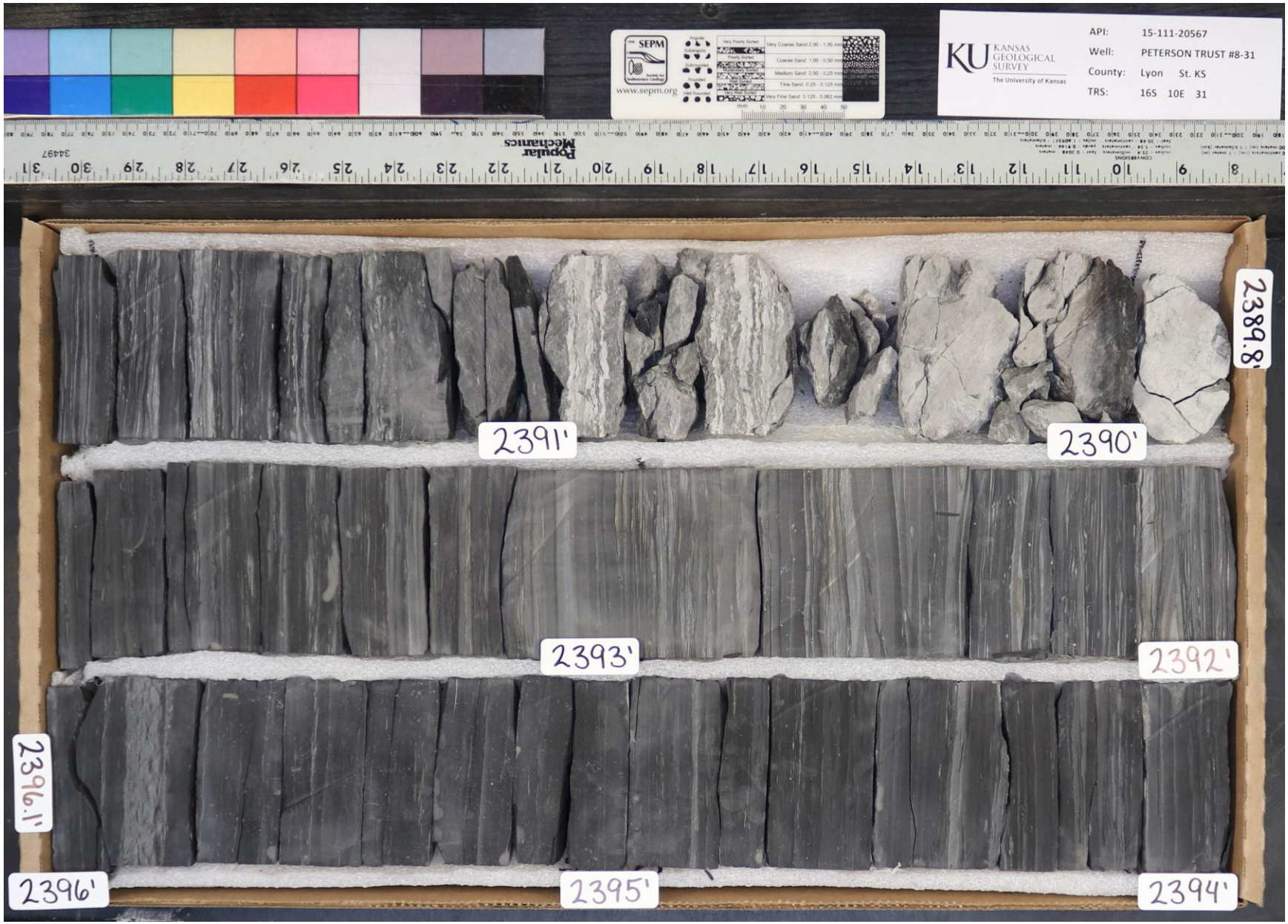
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2383.8'
2385'
2384'
2387'
2386'
2389.8'
2389'
2388'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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
Popular Mechanics
2389.8'
2391'
2390'
2393'
2392'
2396.1'
2396'
2395'
2394'


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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
Popular Mechanics
2396.1'
2397'
2400.3'
2400'
2399'


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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
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2400.3'
2402'
2401'
2404'
2403'
2406.4'
2406'
2405'


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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
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Popular Mechanics
2406.4'
2407'
2408'
2410'
2411'
2412'
2412.7'

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API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
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Popular Mechanics
2412.7'
2413'
2414'
2415'
2416'
2417'
2418'
2419'


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The University of Kansas
API: 15-111-20567
Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
Popular Mechanics
2419'
2421'
2420'
2422'
2424'
2423'


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TRS: 16S 10E 31
Popular Mechanics
2424.9'
2426'
2425'
2429'
2428'
2427'
2431.2'
2431'
2430'


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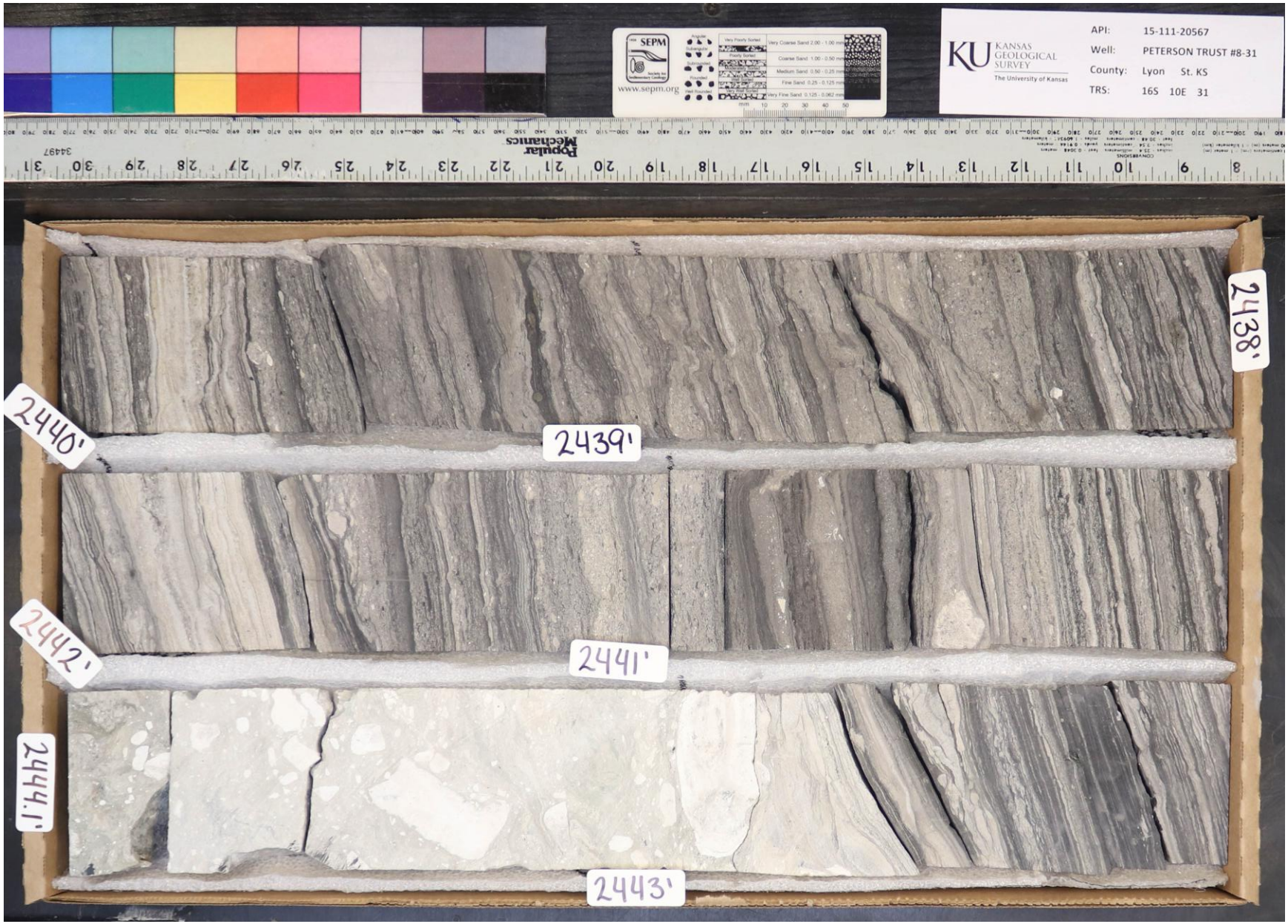
TRS: 16S 10E 31
2431.2'
2432'
2435'
2436
2438.
2437'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2438'
2439'
2440'
2441'
2442'
2443'
2444'


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Well: PETERSON TRUST #8-31
County: Lyon St. KS
TRS: 16S 10E 31
2446'
2445'
2447'
2449'
2444'