

KANSAS GEOLOGICAL SURVEY
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Stratigraphic Sections -
Bourbon County, Kansas
1993-94 Field Season

by

R.R. West
R.S. Sawin

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KANSAS GEOLOGICAL SURVEY
1930 Constant Avenue
University of Kansas
Lawrence, KS 66047

**STRATIGRAPHIC SECTIONS -
BOURBON COUNTY, KANSAS
1993-94 FIELD SEASON**

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R. R. West and R. S. Sawin

Stratigraphic Sections - Bourbon County, Kansas - 1993-94 Field Season

As part of the mapping of Bourbon County, Kansas, stratigraphic sections, both in outcrop and core, were measured and described. Included in this report are nine sections based on outcrop exposures and two core descriptions. In addition to standard legal descriptions each outcrop exposure is identified by either a BB - site number (BB = Bourbon) or an R. R. West Locality Number (a three digit number without a BB prefix); both are noted on the field copies of our maps. These sections, both outcrops and cores, are all subject to corrections, additions, revisions, reinterpretations, and remeasurement (indeed several are noted for remeasurement). They are provided at this time so that they are more readily available to the general public and others.

Descriptions of the two cores located in the 1958 (photorevised 1978) Marmaton, Kansas 7.5 minute U.S.G.S. Topographic Quadrangle were part of a 1991 - 1992 study on the detailed stratigraphy of the Fort Scott Limestone funded by the Kansas Geological Survey and conducted by R. R. West. The cores were taken by the Kansas Geological Survey in June of 1992 and the logs prepared by two geology students at Kansas State University under the supervision of R. R. West with financial support from the Kansas Geological Survey. The status of this 1991 - 1992 study was reported to the Kansas Geological Survey in a Summary of Research dated 29 April 1992. At that time the cores had not yet been taken. Core descriptions and copies of the radioactivity (gamma ray and neutron) logs are included here because of their bearing on the Bourbon County mapping project.

MEASURED SECTION AT BB - SITE 12

T. 25S. , R. 25E., County Bourbon

State Kansas Scale

Scale: 1.0" = 1.0m.

Sec. 27

Locality Description: Along South line of SE1/4, SW1/4, SE1/4, Sec.

27, T. 25S., R. 25E., Bourbon Co., Kansas; road ditch along north side of road from creek westward to mailbox; 1978 Fort Scott 7.5' Quad.

Measured By: R.R. West

Date: 13 Aug '93

Remarks:

Loc.No.

Bed No.	Description	Thickness
11	Medium gray to yellowish brown, thin, wavy bedded algal wackestone; 0.35 to 0.4m. exposed, top eroded.	
10	Yellowish brown to gray, fossiliferous (<i>Crurithyris</i> , and crinoid fragments) mudrock; 0.27m. thick.	
9	Hard, dense layer of clayey carbonate nodules. appears continuous; 0.05m. thick.	
8	Black to dark gray, more yellowish brown upward, clayrock; contact with underlying unit more gradational than sharp; 0.26m. thick.	
7	Black, fissile shale; 0.56m. thick.	
6	Yellowish gray clayrock; 0.06m. thick.	
5	Medium gray, thin, discontinuous carbonate bed; 0.05m. thick.	
4	Yellowish gray clayrock; 0.22m. thick.	
3	Coal; about 0.03m. thick.	
2	Medium gray to yellowish brown mudrock, more medium to dark gray in upper part; similar to an underclay; 0.74m. thick, lower part covered.	
1	Brownish red to grayish red, pitted, corroded limestone exposed low in ditch on north side of road; base covered.	

NOTE: Inferred elevations - base of unit 1 at 830', top of unit 1 at 835.5', base of unit 11 at 843', top of unit 11 at 848'; sequence is similar to that at BB - SITES 15 and 16.

STRATIGRAPHIC INTERPRETATION OF BB-SITE 12

Unit 1 is Blackjack Creek Limestone Member

Units 2 through 8 are in the Little Osage Shale Member; unit 3 is the Summit Coal.

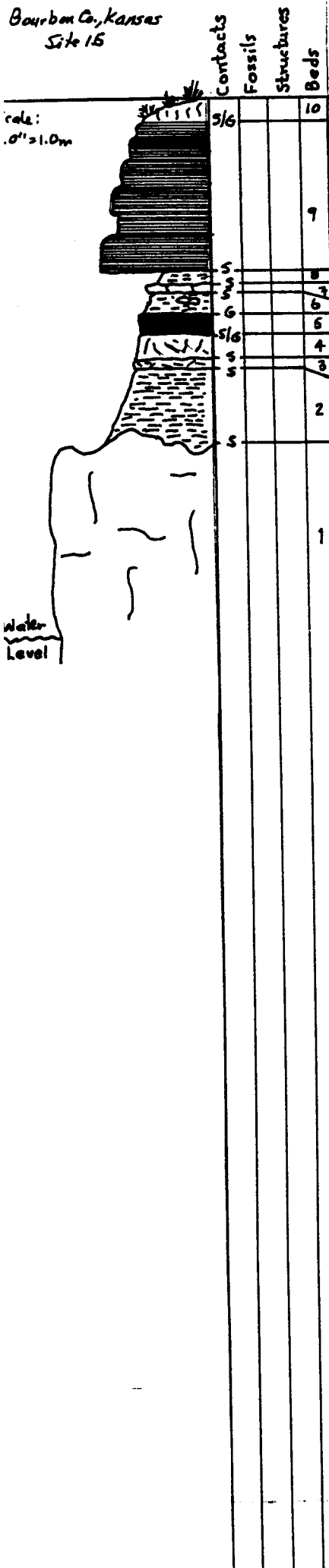
Units 9 through 11 are possibly the interval of the Houx-Higginsville Limestone Member.

MEASURED SECTION AT BB - SITE 15

T. 25S. , R. 25E. , County: Bourbon

State Kansas Scale

Scale:
1" = 1.0m



Sec. 31

	*		

Locality Description: Near Center, SW1/4, SW1/4, NE1/4, Sec. 31, T.25S., R.25E., Bourbon County Kansas; stream bank on east side of Buck Run in the northwest corner of the intersection between 12th Street and U.S. Hwy 69, 1978 Fort Scott 7.5' Quad.
Measured By: R.R. West

Date: 14 Aug. '92

Remarks:

Loc.No.

Bed No.	Description	Thickness
10	Soil, sharp to gradational contact with underlying unit; 0.15m. thick.	
9	Black, blocky, platy to fissile shale with phosphate nodules and layers, sharp contact with underlying unit; 0.72m. thick.	
8	Black to dark gray, flaky clayrock with some iron staining and broken skeletal (linoproductid?) debris; 0.075m. thick.	
7	Dark to medium gray fresh, light gray to whitish yellow brown weathered; very clayey, fossiliferous (<i>Worthenia</i> -like snails), pyritic, hard, irregular bed of wackestone; fossil fragments oriented parallel to bedding; 0.03 to 0.05m. thick.	
6	Clayrock like unit 8 above, but more fossiliferous; occasional nodules of carbonate similar to unit 7 above; sharp upper contact but lower contact with coal is gradational; fragments of calcareous brachiopod shells and lingulids in lower black fissile part, but no phosphate nodules; 0.15m. thick.	
5	Blocky coal with sulfur stains on bedding planes; 0.13m. thick.	
4	Dark to medium gray, flaky clayrock, poorly developed underclay; lower contact sharp on weathered surface, but coaly with more clay; 0.16m. thick.	
3	Clayrock similar to unit 4 above, iron stained; more or less laterally continuous; 0.02 to 0.05m. thick.	
2	Dark to medium gray mudrock similar to unit 4 above; lower 0.20 to 0.25m. is light gray, silty, flaky to near platy mudrock; 0.52m. thick.	
1	Light to medium light gray fresh, light gray with faint yellowish brown stains weathered, thick to massive beds, hard, sparsely fossiliferous wackestone; upper surface highly irregular, pitted (suggesting a palaeokarst surface); water level was 1.3m. below upper surface on 14 Aug. '92.	

PHOTOGRAPHS TAKEN AT BB-SITE 15

Roll 163, frames 1 through 5; frames 1 through 3 are where section was measured; frames 4 and 5 are of the top of unit 1 and a close-up of weathered interval just south of frames 1 through 3.

STRATIGRAPHIC INTERPRETATION OF BB-SITE 15

Unit 1 is the Blackjack Creek Limestone Member

Units 2 through 9 are the Little Osage Shale Member; unit 5 is the Summit Coal

MEASURED SECTION AT BB - SITE 16

T. 25S., R. 25E., County Bourbon

State Kansas Scale

Scale: 1.0" = 1.0m

Contacts
Fossils
Structures
Beds

Sec. 31

Locality Description: Near SW corner, NE1/4, Sec. 31. T.25S., R.25E.,
Bourbon County, Kansas; stream bank on the west side of Buck
Run in the southwest corner of the intersection between 12th
Street and U.S.Hwy 69, 1978 Fort Scott 7.5' Quad.

Measured By: R.R. West

Date: 14 Aug '92

Remarks: Checked and Units 2-2d added w/ R.S. Sagarin 2 June '94 Loc.No.

Uneven
oxidized
surface

Bed No.	Description	Thickness
8	Soil, 0.5m. thick.	
7	Light gray fresh, medium gray with some iron staining weathered; thin to medium wavy bedded skeletal and algal wackestone; each bed is 0.1 to 0.3m. thick separated by a clayey parting; uneven, oxidized surface about 1.10m below top of unit, beds below conform to this uneven surface; 2.5m. thick.	
6	Medium gray, slightly splintery, blocky to platy mudrock; 0.11m. thick.	
5	Light to medium gray, dense, nodular-like limestone (wackestone), continuous; 0.03 to 0.07m. thick.	
4	Dark gray to black, blocky to platy, hard, splintery mudrock with some iron staining about 0.15m. below top of unit; 0.45m. thick.	
3	Black, blocky, platy to fissile shale with phosphate nodules and layers; 0.55m. thick.	
2d	Dark medium gray to black, platy, crumbly, fossiliferous (<i>Desmoinesia</i>), calcareous mudrock; 0.07m. thick.	
2c	Dark medium gray fresh, weathers light gray, nodular, fossiliferous, clayey wackestone; bed undulates, 0.05 to .010m. thick.	
2b	Dark gray to black, platy, fissile mudrock/shale with plant debris and fragments of shelly fossils; 0.05 to 0.10m. thick.	
2a	Coal, blocky; 0.13m. thick.	
2	Light gray to olive gray, badly weathered mudrock/underclay; 0.20m. exposed, base covered.	
1	Light to medium light gray fresh, light gray with faint yellowish brown stains weathered, thick to massive beds, hard, sparsely fossiliferous wackestone; upper surface highly irregular, pitted (suggesting a palaeokarst surface); same as unit 1 at BB-SITE 15; top of unit in stream bed, thickness estimated as 1.8m. 19 May'94.	

NOTE: Elevation of the top of unit 5 estimated as 845'; elevation of the top of unit 1 is estimated as 827'; The sequence here (site 16), combined with the sequence at site 15 is similar to the upper part of the sequence in the railroad cut below old Fort Scott (my locality number 881).

PHOTOGRAPHS TAKEN AT BB-SITE 16

Roll 163, frames 6 and 7 are where section was measured; frame 8 is closer to 12th Street (scale is one meter long in frame 8).

STRATIGRAPHIC INTERPRETATION OF BB-SITE 16

Unit 1 is the Blackjack Creek Limestone Member.

Units 2 through 4 are the Little Osage Shale Member; unit 2a is the Summit Coal.

Units 5 through 7 are possibly the interval of the Houx-Higginsville Limestone Member

MEASURED SECTION AT BB - SITE 20

T. 25S. , R. 25E. , County: Bourbon

State Kansas

Scale

Contacts
Fossils
Structures
Beds

Sec. 31

		K

Locality Description: Near Center of West line of NW1/4, NE1/4, Sec.31,
T.25S., R.25E., Bourbon County, Kansas; steam bank on both sides
of Buck Run just west of U.S.Hwy 69, 1978 Fort Scott 7.5' Quad.

Measured By: R.R. West + R.S. Saurin

Date: 2 June '94

Remarks:

Loc.No.



Bed No.	Description	Thickness
3	Light gray to light olive gray indistinctly bedded mudrock with "slicks?"; wavy, irregular bedding more distinct in lower part; coal smut with sulfur staining at top; 0.66m. thick, top not exposed.	
2	Light to medium gray, heavily iron stained, especially the upper part, weathers about the same colours, silty, clayey, carbonate with little or no bedding, upper surface very irregular, deeply pitted and heavily iron stained, nearly black in places, rhizoliths conspicuous, entire unit suggests extensive pedogenesis; up to 0.65m. thick.	
1	Light to medium gray fresh, light yellowish gray to yellowish brown weathered, laminations to beds (4 to 10 cm.), thick of sandy, silty, carbonaceous (plant debris) mudrock top clayey fine grained, well sorted sandstone and siltstone, some beds of latter are lenticular; cross laminations conspicuous (probably channel fills) with oscillation ripple marks (in upper part of unit the crests of these ripples strike 135 degrees); pebble to small cobble sized pieces of fine grained sandstone within cross laminated "packages"; parts of unit show an alternation between "packages" of very thin and "packages" of thicker laminations suggesting the possibility of a tidal influence; 2.3m. thick, base covered.	

NOTE: Distance from the top of unit 2 to the top of what is considered the Blackjack Creek limestone is 12.3'; to what is considered the base of the Higginsville limestone the distance is 21.2'; thus the interval between these two, the presumed Little Osage shale is 8.9' thick.

PHOTOGRAPHS TAKEN AT BB-SITE 20

Roll 180, frames 18 through 28

STRATIGRAPHIC INTERPRETATION OF BB-SITE 20

Unit 1 is the upper part of the Lagonda Formation

Unit 2 is the Breezy Hill Limestone Member

Unit 3 is an underclay below the Mulky Coal which was mined in this area, see Schowe, 1959, KGS Bull.134, pt.5, p.213.

Blocks of black, platy to fissile shale, probably Excallo, can be seen in the west side of the creek bank upstream from where section was measured; these probably reflect collapse after the coal (Mulky) was removed.

Bourbon Co., Kansas
Site 60

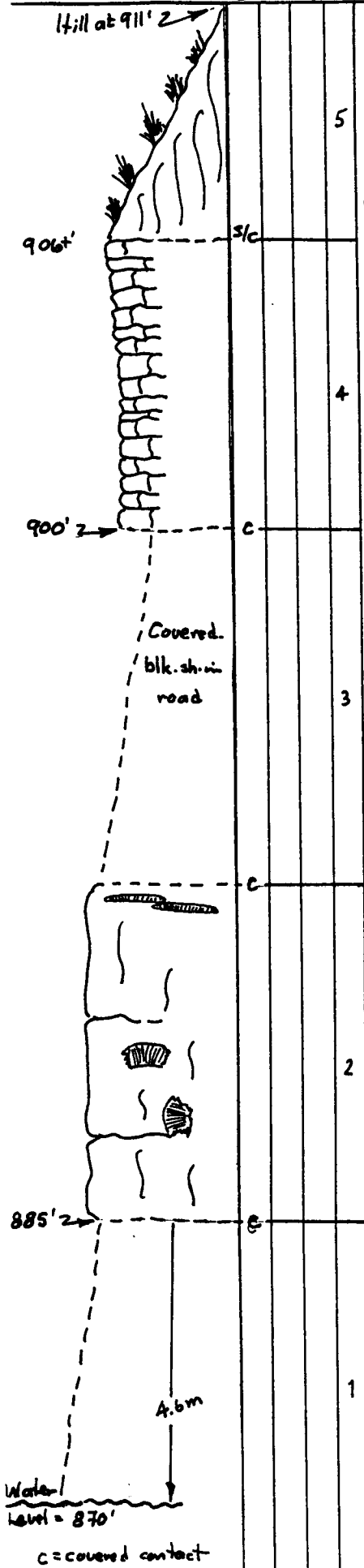
Scale: 1.0" = 1.0m.

Contacts
Fossils
Structures
Beds

MEASURED SECTION AT BB - SITE 60

T. 27S. , R. 24E. , County: Bourbon

State Kansas Scale



Sec. 14

Locality Description: Near Center of South line SE1/4, SE1/4, SW1/4, _____
Sec. 14, T.27 S., R.24E., Bourbon County, Kansas; above stream _____
and along north side of road; 1964 Hiattville 7.5' Quad.

Measured By: R.S. Sawin Date: Late May '92

Remarks: Remains in detail. Loc.No. _____

Bed No.	Description	Thickness
5	Soil; 1.5m. thick.	
4	Thin, wavy bedded limestone in road; 1.8m. exposed, top and base covered.	
3	Covered interval; black, fissile shale in road; 2.3m. thick.	
2	Medium to thick beds of limestone with low domical (@ 0.1m. in diameter) and tabular chaetetids above creek bank; 2.1m. exposed, top and base covered.	
1	Covered interval; 4.6m. thick.	

NOTE: Elevation at water level is 870', at inferred base of unit 2 it is 885', at inferred base of unit 4 it is 900', and at the top of unit 4 it is 906'.

PHOTOGRAPHS TAKEN AT BB-SITE 60
Roll 180, frames 32 and 33.

STRATIGRAPHIC INTERPRETATION OF BB-SITE 60
Unit 4 is the Higginsville Limestone Member.
Unit 3 is the Little Osage Shale Member.
Unit 2 is the Blackjack Creek Limestone Member.

MEASURED SECTION AT BB - SITE 87

Scale 0.5" = 1.0m.

T. 27S., R. 24E., County: Bourbon

State Kansas Scale

958' 2

951' 2

928' 2

Mostly Covered

Water level 900'

Contacts
Fossils
Structures
Beds

8

7

6

5

4

3

2

1

Sec. 13

Locality Description: From stream just North of the Center to the top of the hill South of the Center of the West line of Sec. 13, T.27S., R.24E., Bourbon County, Kansas along both sides of the road; top of section ends across the road from the Pleasant Hill Cemetery; 1959
Measured By: R.R. West & R.S. Sawm Cato 7.5' Quad. Date: 3 June '94
Remarks: Loc.No.

Bed No.

Description

Thickness

- 8 - Thin, wavy beds of yellowish gray limestone in road; thickness not measured.
- 7 - Covered interval, black, fissile shale in road; @ 2.1m. thick.
- 6 - Grayish brown, clayey, earthy carbonate; @ 0.4m. thick.
- 5 - Mostly covered interval; @ 6.3m. thick.
- 4 - Coal smut; less than a centimeter.
- 3 - Light gray, clayey, earthy, pedogenic carbonate with *Stigmara* root containing rootlets perpendicular to bedding; @ 0.2m. thick.
- 2 - Covered interval; @ 8.3m. thick.
- 1 - Gray, thin, wavy bedded carbonate is the bed of the creek.

NOTE: Elevation are as follows: creek bed is 900', top of unit 3 is 928', top of unit 6 is 951', and top of unit 7 is 958'.

STRATIGRAPHIC INTERPRETATION OF BB-SITE 87

- Unit 8 is the Myrick Station Limestone Member.
- Unit 7 is the Anna Shale Member.
- Unit 6 is the so called Childers School limestone.
- Unit 4, the coal smut, could be the Alvis Coal.
- Unit 1 is the Higginsville Limestone Member.

Contacts
Fossils
Structures
Beds

T. 27S. , R. 24E., County: Bourbon

State Kansas Scale

Scale

Scale: 1.0" = 1.0m.

890.25' Eroded top

Sec. 24

Locality Description: From near the Center of North line of NE1/4, NW1/4, up the hill to near the Center of NE1/4, NW1/4, NW1/4, Sec. 24, T.27S., R.24E., Bourbon County, Kansas; from creek bed across wooded area into pasture to farm pond; 1959 Cato 7.5' Qu	
Measured By: K.L. West & R.S. Sawin	Date: 3 June '94
Remarks: Remove in detail	Loc.No.

Measured By: K.J. West & R.S. Sawin

Remarks: Remains in detail

Loc.No.

Bed No.	Description	Thickness
6	Yellowish brown to medium gray, thin, regular bedded algal wackestone with prominent NW-SE and NE-SW joint sets; 2.7m. thick, top eroded.	
5	Gray, crumbly mudrock; 0.14m. thick (exposed and measured on the north side of the road near the Center of SW1/4, SE1/4, SW1/4, Sec. 13, T.27S., R.24E).	
4	Black, platy to fissile shale; 0.3m. thick, base covered (exposed and measured at the same site as unit 5).	
3	Covered interval; @ 1.5m. thick.	
2	Dark gray fresh, weathers reddish brown, hard, dense thin to thick beds of wackestone with low domical to tabular chaetetids; 2.5m. thick, base covered.	
1	Covered interval, unmeasured; based on float in creek and discussions with the landowner the Excello shale and Mulky Coal occur in this interval.	

NOTE: Elevations are as follows: base of unit 2 at 866' or less, top of unit 2 at 874.3', base of unit 6 at 880.5', and top of unit 6 at 890.3'.

STRATIGRAPHIC INTERPRETATIONS ON BB-SITE 97

Unit 6 is the Higginsville Limestone Member.

Units 3 through 5 is the Little Osage Shale Member.

Unit 2 is the Blackjack Creek Limestone Member.

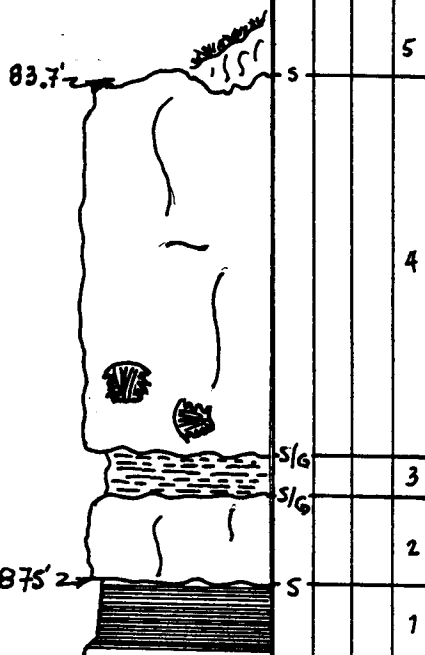
c = covered contact

MEASURED SECTION AT BB - SITE 121

T. 27 S., R. 25 E., County: Bourbon

State Kansas Scale

Scale: 1.0" = 1.0m.



Sec. 7

Locality Description: Near SE corner, SW1/4, SE1/4, Sec. 7, T. 27 S.,
R. 25 E., Bourbon County, Kansas; in an old "strip pit" and/or
quarry; 1959 Cato 7.5' Quad.

Measured By: R.R. West

Date: 4 June '94

Remarks: Re-measure in detail

Loc. No.

Bed No.	Description	Thickness
5	Soil; @ 0.3m. thick.	
4	Medium gray fresh, weathers reddish brown, hard, dense, thick to massive bed of wackestone with low domical chaetetids in lower part, some overturned; @ 2.0m. thick.	
3	Yellowish brown mudrock; @ 0.2m. thick.	
2	Brownish gray, medium bed of earthy carbonate; @ 0.45m. thick.	
1	Black, platy to fissile shale; estimated 0.3m. thick.	

NOTE: Elevations are as follows: base of unit 2 at 875', and top of unit 4 at 883.7'.

STRATIGRAPHIC INTERPRETATION OF BB-SITE 121

Unit 1 is the Excello Shale Member

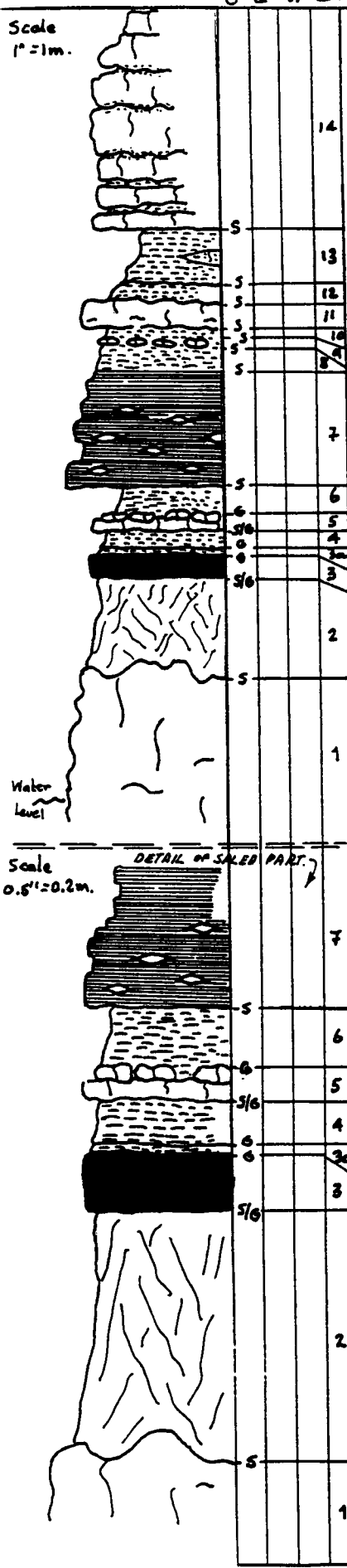
Units 2 through 5 are the Blackjack Creek Limestone Member.

SECTION AT LOCALITY NO. 928

T. 26S, R. 24E, County: Bourbon

State Ks.

Scale

Scale
1" = 1m.

Sec. 2

*			

Locality Description: NE1/4, SW1/4, NW1/4, Sec. 2, T.26S.,
R.24E., Bourbon Co., Kansas; 1958 Marmaton, Ks. 7.5'
Quad; spillway of Rock Creek Lake; Loc. No. 928

Measured By: R.R. West + R.S. Sawin

Date: 20 May '94

Remarks:

Loc. No. 928

Bed No.

Description

Thickness

- 14 - Skeletal, algal wackestone; med. gry. fresh, yellowish brn. weathered; thin, irregular beds at base with thin clayey partings; upper beds are thin and wavy; 1.45m. exposed at spillway, but southeast of spillway, along the edge of Rock Creek Lake it is possible to measure the remainder of this unit and the lower part of the overlying unit (about 1.0m of yellowish brn. sandy mudrock; *tabular chaetetids* occur in the upper 1.0 m. of unit 14; total thickness of unit 14 is 5.3m (17.4') and the elevation at the top of this unit is 813'.
- 13 - Silty, calcareous mudrock, brownish, carbonaceous with a brown, earth, clayey, silty carbonate mudrock lense; this carbonate lense is up to 0.1m. thick and lithologically is like unit 11 but contains abundant brachiopods, especially *Crurithyris*, in places; unit 13 is 0.35m. thick.
- 12 - Light gry. to black, platy, calcareous mudrock at top to dark gry. to brn., fossiliferous, silty mudrock at base; upper part is 0.04 to 0.08 m. with *Chondrites* and *Dunbarella* frags.; lower part is 0 to 0.05m. with *Crurithyris*; unit 12 is 0.1m. thick.
- 11 - Hard, dense, clayey wackestone, with a few scattered broken shell fragments; medium gry. fresh, yellowish brn. weathered; unit 11 is 0.165m. thick.
- 10 - Black, platy, fossiliferous mudrock, with *Chondrites* and some shelly fossils as in unit 9 but less conspicuous, possibly some bivalve molds; unit 10 is 0.05m. thick.
- 9 - Black, calcareous, fossiliferous mudrock to carbonate mudrock nodules; *Orbiculoidea*, and *Crurithyris*; latter are sometimes in clusters; unit 9 is 0.04m. thick.
- 8 - Poorly bedded, light to medium gry. fresh, yellowish brn. weathered, platy, flakey, possibly fossiliferous mudrock with iron oxide staining and carbonaceous stringers; unit 8 is 0.15m. thick.
- 7 - Black, platy to blocky, fissile shale with phosphate nodules, upper part is less fissile and fossils are conspicuous in the upper 0.2m.; in the upper 0.05m. *Chondrites* is abundant, fragments of *Xenocanthus* and articulated *Mesolobus* are present; unit 7 is 0.77m. thick.
- 6 - Black, calcareous mudrock with fossils as in limestone below; unit 6 is 0.15m. thick.
- 5 - Dark gry. to black clayey, fossiliferous carbonate mudrock; thin clayey parting between two thin beds, the upper is nodular in part; marine fossils are abundant and include *Mesolobus* and *Desmoinesia* (not in life position); unit 5 is 0.1m. thick.
- 4 - Dark gry. to black, fossiliferous mudrock; single valves of *Dunbarella* in lower part; unit 4 is 0.115m. thick.
- 3a - Black, flakey, carbonaceous mudrock with abundant plant debris; unit 3a is 0.015m. thick.

See back for beds 1 through 3

10

- 3 - Coal with up to 0.01m. thick lenses of pyrite, poor quality; unit 3 is 0.15m. thick.
- 2 - Medium to dark gry (in lower part) and black (in upper part) mudrock, with Makkaro structures, slickensides, and little to no bedding; unit 2 is 0.6m. thick.
- 1 - Hard, dense, medium to thickly bedded, fossiliferous clayey wackestone, light to medium gry; fossils include *Echinaria*, *Composita*, *Antiquatonia*, and *Stigmara* root systems on upper surface; upper surface strongly suggests erosion, palaeokarsting; unit 1 is 1.0m. thick, but base is underwater.

PHOTOGRAPHS TAKEN AT LOCALITY NO. 928

Roll 160, frames 9 through 29 (160-26 discarded, no good).

Roll 180, frames 12 through 17; 12 and 13 are general view of exposure, 14 and 15 are of a *Stigmara* root system on the upper surface of unit 1; and 16 and 17 are of tabular chaetetids in the upper 1.0m. of unit 14.

STRATIGRAPHIC INTERPRETATION OF LOCALITY NO. 928

Unit 1 is the Blackjack Creek Limestone Member.

Units 2 through 10 are the Little Osage Shale Member, the coal, unit 3 is the Summit Coal.

Units 11 through 14 are the Houx (unit 11)-Higginsville (unit 14) Limestone Member.

Above unit 14 the base (lower 1.0m.) of the Labette Shale is exposed.

KGS - Ater # 1 - NW corner, Sec. 33, T.25S., R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.; ground level elevation = 854.5' (2.5' lower than USGS reference elevation, 857, at road intersection); rock exposed at surface is a thin bedded, platy, skeletal wackestone with foraminiferids, recrystallized skeletal grains and tabular chaetetids (Pawnee Limestone, probably Laberdie Limestone Member); surface casing to 2'2".

Coring started at 2'2" at 11:30AM on 23 June 1992

Core #1 from 2'2" to 9'2"	; recovered 7'
Core #2 from 9'2" to 18'2"	; recovered 8'8.5" (lost 3"??)
Core #3 from 18'2" to 28'	; recovered 9'9.5"
Core #4 from 28' to 38'	; recovered 9'10.75"
Core #5 from 38' to 48'	; recovered 10'
Core #6 from 48' to 58'	; recovered 10'
Core #7 from 58' to 68'	; recovered 9'11" (lose in coaly layer?)
Core #8 from 68' to 78'	; recovered 9'11" (lose in shale at top?)
Core #9 from 78' to 88'	; recovered 10'
Core #10 from 88' to 98'	; recovered 10'2"
TAPED HOLE DEPTH IS 97'11"	
Core #11 from 97'11" to 107'11"	; recovered 9'11"
Core #12 from 107'11" to 117'11"	; recovered 9'11"
TAPED HOLE TOTAL DEPTH = 117'8"	

Completed coring at approximately 8:00 PM, 23 June 1992.

Logged (gamma ray and neutron) hole through PVC tubing the morning of 25 June 1992; total depth for log is 114.9'.

DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
B	IP					
		20				
		18				
		16				
		14				
		12				
0.67	2' 3"	10				
		8				
1.14	3' 9"	6				
		4				
1.49	4' 10"	2				
1.86	6' 1"					

L Very light gray (N8) wackestone, algal, brachiopods, fusulinids; interbedded with very pale orange (10YR8/2) claystone; moldic porosity; gradational upper contact.

K Very light gray (N8) wackestone, crinoids, fusulinids, algal, articulated brachiopods; very pale orange (10YR8/2) "wispy" argillaceous partings at lower contact, 4.5, 11, 18, 21, 25, 28 and 32cm above lower contact; pale yellowish brown (10YR6/2) oil stains throughout; moldic porosity; upper and lower gradational contacts.

J Very light gray (N8) to yellowish gray (5Y8/1) wackestone, algal, articulated and disarticulated brachiopods, fusulinids; argillaceous partings at lower contact and 6cm above it; sharp upper and lower contacts.

DEPTH		SCALE		BED INTERVAL	BED No.	
M	FT	M	FT			
		2	20			
			18			
1.96	6' 1"		16			
			14			
2.16	7' 1"		12			
			10			
			8			
2.98	9' 5"		6			
			4			
3.07	10' 1"		2			
			0			
3.26	10' 8"					
3.50	11' 6"					

I Brownish black (5YR2/1) bituminous mudstone; pyritic; sharp upper and lower contacts.

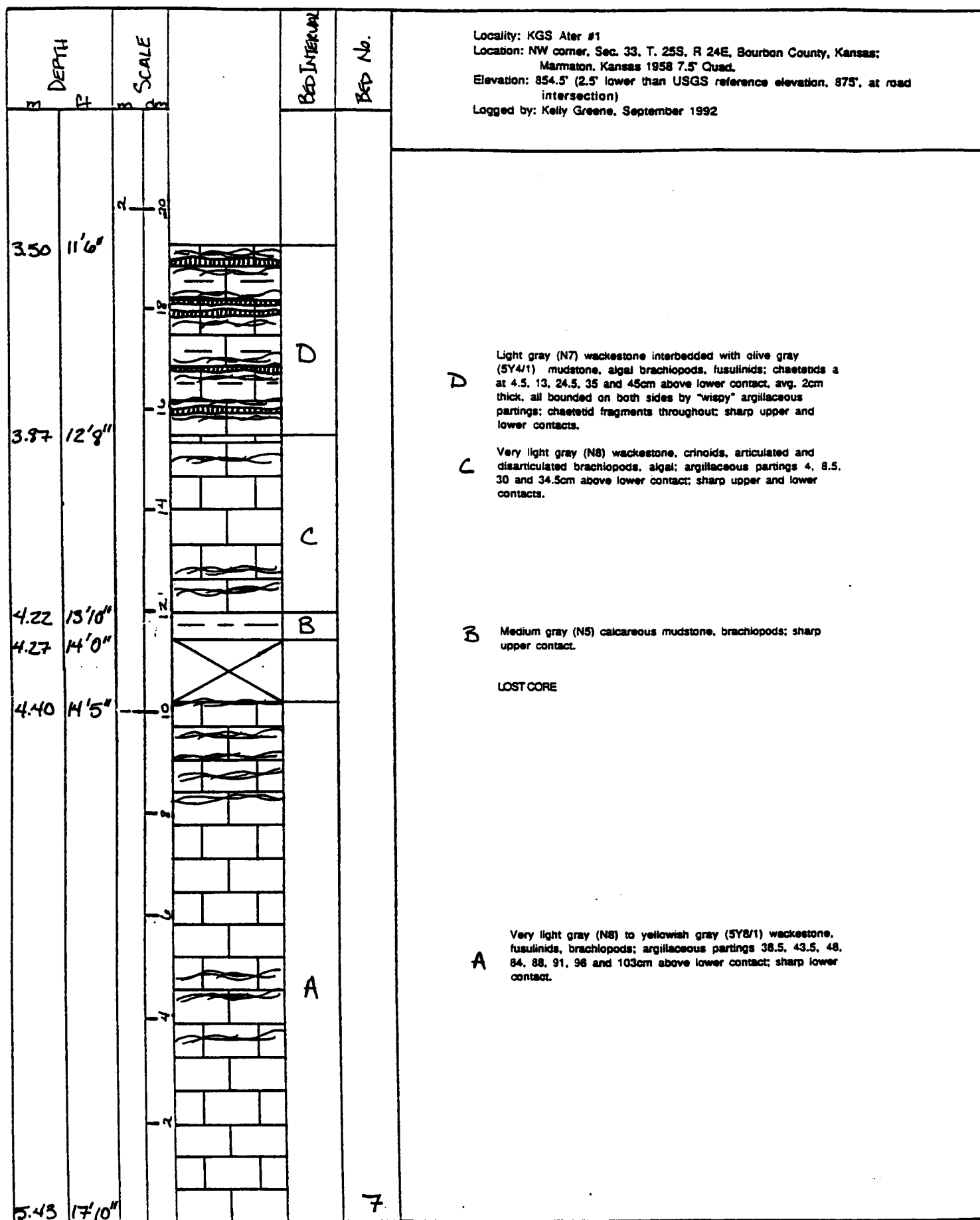
H Very light gray (N8) wackestone, algal, brachiopods, fusulinids, horn coral; argillaceous partings 22, 37, 55, 81cm above and at lower contact; sharp upper and lower contacts.

G Light gray (N7) wackestone interbedded with light olive gray (5Y6/1) mudstone, crinoids, brachiopods, algal; sharp upper and lower contacts.

F Olive gray (5Y3/1) mudstone; chaetetids 2.5cm through 8cm above lower contact, avg. 5mm thick; chaetetid fragments throughout; wackestone clast similar in lithology to unit below. 5cm below upper contact; sharp upper and lower contacts.

7E Very light gray (N8) wackestone, churned, algal, horn coral?; argillaceous partings 3, 11 and 19cm above lower contact; sharp upper and lower contacts.

Locality: KGS Ater #1
Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas;
Marmaton, Kansas 1958 7.5' Quad.
Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection)
Logged by: Kelly Greene, September 1992



DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5" Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
m	ft					
		20				
		18				
5.43	17' 10"	16				
		14				
		12				
		10				
		8				
6.28	20' 7"	6				
		4				
6.40	21' 0"	2				
		0				
7.06	23' 2"					

S Grayish black (N2) bituminous mudstone, pyritic, pyritized brachiopods; light gray (N7) skeletal claystone bands in upper portion; gradational upper and lower contacts.

R Dark gray (N3) and light gray (N7) skeletal claystone, brachiopods, crinoids; pyritic; gradational upper and lower contacts.

Q Finely laminated dark gray (N3) bituminous mudstone with very light gray (N8) calcareous bands; pyritic; gradational upper contact.

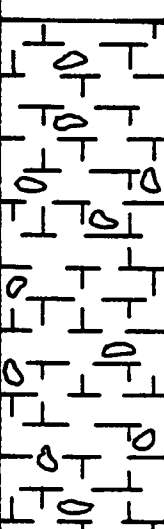
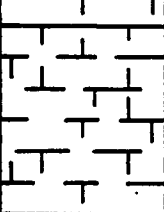
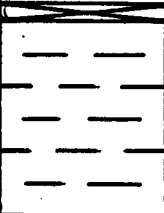
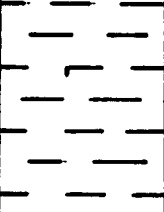
DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marion, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
ft	in					
7.04	23' 2"	20				Q Finely laminated dark gray (N3) bituminous mudstone with very light gray (N8) calcareous bands; pyritic; gradational upper contact, cont'd.
		18				
		16				
		14				
		12				
		10				
8.04	26' 4"	8				
8.10	26' 9"	6				
		4				
8.56	28' 1"	2				
8.61	28' 3"					P LOST CORE P Finely laminated dark gray (N3) bituminous mudstone with very light gray (N8) calcareous bands; pyritic.
8.89	29' 2"					O LOST CORE O Finely laminated dark gray (N3) bituminous mudstone with very light gray (N8) calcareous bands; pyritic; gradational lower contact.

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Mammoth, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 375', at road intersection) Logged by: Kelly Greene, September 1992
m	ft					
8.89	29'2"	20				○ Finely laminated dark gray (N3) bituminous mudstone with very light gray (N8) calcareous bands; pyritic; gradational lower contact, cont'd.
		18				
		16				○ Dark gray (N3) bituminous mudstone; finely laminated very light gray (N8) calcareous bands; pyritic nodules and bands; Dunbarella; calcite filled fractures; gradational upper contact.
		14				
		12				N
		10				
9.89	32'5"	8				
		6				
		4				
		2				
10.91	35'5"					

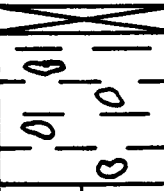
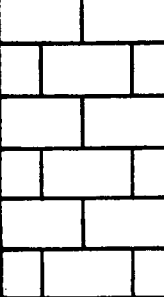
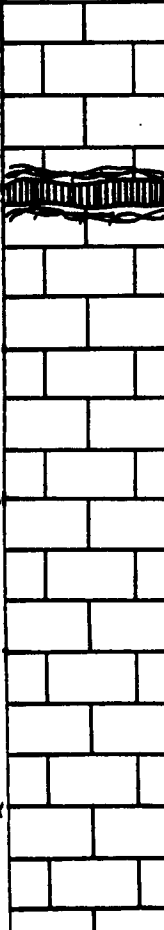
DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
m	f					
10.31	35' 5"	20		N		Dark gray (N3) bituminous mudstone; finely laminated very light gray (N8) calcareous bands; pyritic nodules and bands; <u>Dunbarella</u>; calcite filled fractures; gradational upper contact. cont'd.
11.63	38' 1"	12				
11.63	38' 2"	10				
		8				
		6				
		4				
		2				
		1				
		0				
		0				
12.81	42' 0"		m		6	Dark gray (N3) bituminous mudstone, <u>Dunbarella</u>, pyritic; pyritic and sideritic bands and lensoid nodules; sharp lower contact.

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5" Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
FT	IN					
12.31	42' 0"	20		3		m Dark gray (N3) bituminous mudstone, <i>Dunbarella</i>, pyritic; pyritic and sideritic bands and lensoid nodules; sharp lower contact, cont'd. L Dark gray (N3) calcareous claystone and light gray (N7) skeletal claystone, brachiopods, crinoids; sharp upper and gradational lower contacts. K Grayish black (N2) coal, calcite filled cracks; pyritic; gradational upper and sharp lower contacts.
14.47	47' 3"	4				
14.67	48' 1"	2		L		
14.77	48' 6"			K	6	

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
m	ft					
14.77	48'6"	2	20	4		4 Light gray (N7) calcareous mudstone with medium dark gray (N4) subrounded calcareous nodules; sideritic nodules; plant debris; sharp upper and lower contacts.
		18	18			
		16	16			
		14	14			
15.75	51'8"	12	12	H		H Light gray (N7) calcareous mudstone; medium dark gray (N4) subrounded calcareous nodules; light brown (5YR7/4) sideritic nodules; root traces?; sharp upper and lower contacts.
		10	10			
		8	8			
		6	6			
16.31	53'6"	4	4	H		H Finely laminated light olive gray (5Y6/1) and light gray (N7) calcareous mudstone; subrounded to lensoid light brown (5YR7/4) sideritic nodules; pyritic nodules; root traces?; sharp upper and lower contacts.
		2	2			
16.77	55'0"				6	

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
M	F					
16.77	55'0"	20		G		G Finely laminated light olive gray (5Y6/1) and light gray (N7) calcareous mudstone; subrounded to lensoid light brown (5YR7/4) sideritic nodules; pyritic nodules; root traces?; sharp upper and lower contacts, cont'd. F Light olive gray (5Y6/1) calcareous mudstone; sharp upper and lower contacts. LOST CORE
17.47	57'4"	18				
17.72	58'2"	16				
17.75	58'3"	14				
		12		F		E Light olive gray (5Y6/1) calcareous mudstone; sharp lower contact. D Medium gray (N5) bituminous mudstone; sideritic nodules; fracture surfaces covered with plant debris; sharp upper and lower contacts.
		10				
		8				
		6				
		4		E		
		2				
		0				
18.56	60'11"	2				
18.80	61'8"	0		D	6	

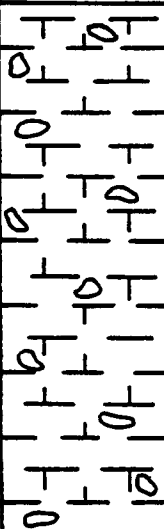
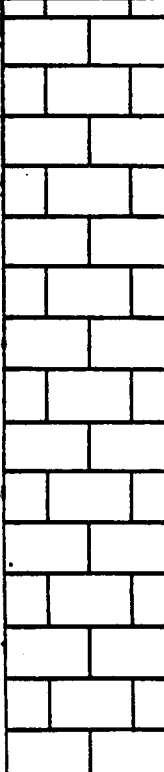
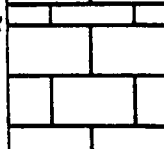
DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5" Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
M	F					
18.80	6'8"	20	10	D		D Medium gray (N5) bituminous mudstone; sideritic nodules; fracture surfaces covered with plant debris; sharp upper and lower contacts, cont'd.
		18	10			
		16	10			
		14	10			
		12	10			
19.70	6'7"	10		C		C Grayish black (N2) coal; calcite filled cracks; pyritic; sharp upper contact. LOST CORE
19.89	6'3"					
19.99	6'7"	2		B		B Medium gray (N5) bituminous mudstone; sideritic nodules; fractured surfaces covered with plant debris; sharp lower contact. 6A Black (N1) coal; calcite filled cracks; sharp upper contact.
		2	10			
		4	10			
		6	10			
		8	10			
20.64	6'8"	2		A		6
20.78	6'2"					

DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
B	IP					
20.78	68' 2"	20		0		LOST CORE O Olive gray (5Y4/1) bituminous mudstone; grayish black (N2) subrounded nodules; sharp lower contact.
20.81	68' 5"					
21.01	68' 11"	10		2		N Yellowish gray (5Y8/1) brecciated wackestone, fusulinids; sharp upper and lower contacts.
21.41	70' 3"	12		3		M Yellowish gray (5Y8/1) to very light gray (N8) churned wackestone, crinoids; chaetetid 23.5 to 28.5 cm below upper contact; argillaceous partings 22 and 28.5cm below upper contact; oil stains 0, 8, 29 and 38cm above lower contact; gradational upper and lower contacts.
22.67	74' 4"				5	

DEPTH		SCALE	BED INTERVAL	BED No.	
m	ft	m			
		20 18 16 14 12 10 8 6 4 2			Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
22.67	74' 4"		L		Very light gray (N8) wackestone, fusulinids, articulated and disarticulated brachiopods, crinoids, chaetetid 17.5 to 12.5cm below upper contact; argillaceous "wispy" partings 6, 10, 15, 21, 44 and 51 cm above lower contact; gradational upper contact, sharp lower contact.
23.18	76' 1"		K		K Very light gray (N8) wackestone interbedded with light olive gray (5Y8/1) mudstone, brachiopods, crinoids; sharp upper and lower contacts.
23.38	76' 8"		U		U Light gray (N7) wackestone, algal, articulated brachiopods, crinoids; yellowish gray (5Y8/1) mudstone partings (avg. 5cm thick) 26 and 44cm above lower contact; argillaceous "wispy" partings 28, 31, 44, 49, 50.5, 64 and 72cm above lower contact; oil stain 51.5cm above lower contact; sharp upper and lower contact.
24.36	79' 11"		I		I Yellowish gray (5Y8/1) mudstone, algal, crinoids, brachiopods; dusky yellowish brown (10YR2/2) oil stains 2 and 5cm above lower contact; sharp upper and lower contacts.
24.51	80' 5"			5	

DEPTH		SCALE		BED	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
M	F					
24.51	80'5"	20		H		H Very light gray (N8) wackestone, algal; sharp upper and lower contacts. G Very pale orange (10YR7/2) and pale yellowish brown (10YR6/2) mudstone, fusulinids; dusky yellowish brown (10YR4/2) oil stain 2cm above lower contact; light gray (N7) wackestone clasts similar in lithology to the unit below; sharp upper and lower contacts. F Light gray (N7) wackestone, algal, brachiopods, crinoids; 5cm thick mudstone parting 11cm above lower contact; light olive gray (5Y5/2) oil stain 2cm above lower contact; sharp upper and lower contacts. E Yellowish gray (5Y8/1) mudstone, algal, crinoids; medium light gray (N8) wackestone clasts similar in lithology to the unit below; light olive gray (5Y5/2) oil stain 3.5cm above lower contact; sharp upper and lower contacts. D Medium light gray (N8) churned wackestone, algal, crinoids, brachiopods; argillaceous "wispy" partings 22, 29, 46, 58.5, 61, 70, 80, 83 and 94.5cm above lower contact; calcite filled vugs; sharp upper and lower contacts. C Light olive gray (5Y8/1) and medium dark gray (N4) wackestone, mottled, brachiopods; <u>Chondrites</u> burrows?; sharp upper and lower contacts. B Grayish black (N2) and olive gray (5Y4/1) bituminous mudstone, articulated and disarticulated brachiopods; carbonate nodules; pyritic; sharp upper and lower contacts.
24.59	80'8"	18		G		
24.69	81'0"	16		F		
24.99	81'11"	14		E		
25.11	82'5"	12		D		
26.06	85'6"	2		C		
26.26	86'2"	2		B		
26.35	86'5"	2			5	

DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
3	4					
26.35	86'5"	20		A	5	5A Light olive gray (5Y6/1) to medium gray (N5) wackestone; sharp upper and lower contacts. E Grayish black (N2) and olive gray (5Y4/1) bituminous mudstone, mottled, articulated and disarticulated brachiopods; carbonate lensoid nodules; sharp upper and lower contacts. D Brownish black (5YR2/1) bituminous mudstone, <i>Dunbarella</i>; very light gray (N8) carbonate bands and lensoid nodules; sideritic lensoid nodules; pyritic; sharp upper and lower contacts. C Dark gray (N3) bituminous mudstone, abundant pyritized brachiopods; carbonate clasts (4 x 2.5cm max.); sharp upper and lower contacts. B Brownish black (5YR2/1) coal; calcite filled cracks; sharp upper and lower contacts. 4A Olive gray (5Y4/1) to light gray (N7) calcareous mudstone; carbonate nodules; sharp upper and lower contacts.
26.53	87'0"	18				
26.84	88'0"	16		E		
		14				
		12				
		10		D		
		8				
27.59	90'6"	6		C		
27.69	90'10"	4		B		
27.78	91'2"	2				
				A	4	

DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
ft	m					
28.21	92'6"	20		A	4	Olive gray (5Y4/1) to light gray (N7) calcareous mudstone; carbonate nodules; sharp upper and lower contacts, cont'd.
28.91	94'10"	10		B		Light olive gray (5Y6/1) and medium dark gray (N4) wackestone, mottled, fusulinids, brachiopods, crinoids; argillaceous parting 17cm below upper contact; sharp upper and lower contacts.
29.91	98'1"	2		A		Olive gray (5Y4/1) and medium gray (N5) wackestone, mottled, crinoids, fusulinids, brachiopods; yellowish gray (5Y8/1) wackestone band 4cm below upper contact; sharp upper and lower contacts.
30.13	98'10"				3	

DEPTH		SCALE		Bed Interval	Bed No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R 24E, Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
B	F					
30.13	98'10"	20		C		C Dark gray (N3) bituminous mudstone; pyritic and sideritic bands and lensoid nodules; calcite filled cracks; sharp upper and lower contacts.
30.98	101'8"	12				
31.33	102'9"	8				
32.13	105'6"	2				
			A		2	2A Medium gray (N5) and dark gray (N4) mudstone, mottled; yellowish gray (SY8/1) carbonate clasts; sharp upper and gradational lower contacts.

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R. 24E, Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
3	4					
32.15	105'6"	20				
		18				
		16				
		14				
		12				
		10				
		8				
		6				
33.31	109'3"	4				
33.36	109'5"	2				
		0				
33.86	111'1"					

C Light gray (N7) and medium gray (N5) siltstone, mottled; pyritic; sparse, very light gray (N8) carbonate clasts; gradational upper, sharp lower contacts.

B Light olive gray (5Y6/1) and medium dark gray (N4) siltstone; pyritic; sharp upper and lower contacts.

A Light gray (N7) siltstone, fine-grained; pyritic; very light gray (N6) calcareous bands; sparse, very light gray (N8) carbonate clasts; sharp upper contact.

DEPTH		SCALE		BED INTERVAL	BED No.	Locality: KGS Ater #1 Location: NW corner, Sec. 33, T. 25S, R 24E, Bourbon County, Kansas; Mammoth, Kansas 1958 7.5" Quad. Elevation: 854.5' (2.5' lower than USGS reference elevation, 875', at road intersection) Logged by: Kelly Greene, September 1992
B	F	B	F			
33.86	111'1"	20		A		1A Light gray (N7) siltstone, fine-grained; pyritic; very light gray (N8) calcareous bands; sparse, very light gray (N8) carbonate clasts; sharp upper contact, cont'd.
		18				
		16				
		14				
		12				
		10				
		8				
		6				
		4				
		2				
35.86	117'8"					

KGS - Ater # 2 - Along east side of road near center of East line, SW1/4, SE1/4, Sec.33, T.25S., R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.; ground level elevation = 867' (from USGS reference elevation along road at this locality; no rock exposed at surface; surface casing to 6'2".

Coring started at 6'2" at 8:40 AM on 24 June 1992.

Core #1 from 6'2" to 6'6.65"	; recovered 0'2.5"
Core #2 from 6'6.65" to 11'	; recovered 3'6"
Core #3 from 11' to 18'	; recovered 7'1" (perhaps only 7')
Core #4 from 18' to 28'	; recovered 9'9"
Core #5 from 28' to 38'	; recovered 10'1.5"
Core #6 from 38' to 48'	; recovered 10'1"

TAPED HOLE DEPTH = 48'

Core #7 from 48' to 58'	; recovered 9'5"
Core #8 from 58' to 68'	; recovered 9'9"
Core #9 from 68' to 78'	; recovered 10'
Core#10 from 78' to 88'	; recovered 10'
Core#11 from 88' to 98'	; recovered 10'1.25"

TAPED HOLE DEPTH = 98'0.5"

Core#12 from 98'0.5" to 108'0.5"	; recovered 9'11.5"
Core#13 from 108'0.5" to 118'0.5"	; recovered 9'6.25"
Core#14 from 118'0.5" to 127'9"	; recovered 10'3"

TAPED HOLE TOTAL DEPTH = 127'10"

* Lost core from these two runs is probably from the reddish brown weathered intervals.

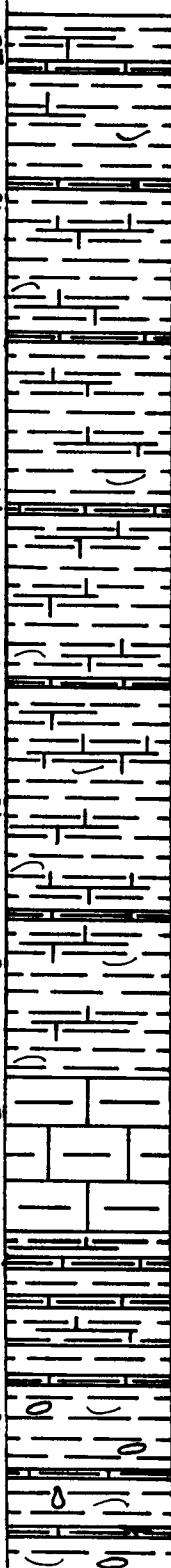
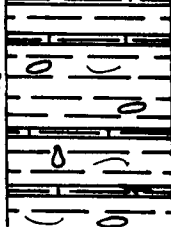
Completed coring at approximately 6:00 PM on 24 June 1992 after thunderstorm.

Logged (gamma ray and neutron) hole through steel drill pipe the morning of 25 June 1992; total depth for log is 127.0'.

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".	
m	ft					Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.	Elevation: Ground level = 867' (from USGS reference elevation along road at this locality).
						Logged By: Erica Anderson, July 1992.	
1.83	6.01	2	20				
1.93	6.33			K		K Very light gray (N8) wackestone; ferric oxide staining, exposure surface?, algal?, disarticulated brachiopods.	
1.99	6.53					LOST CORE 6.1cm (2.4")	
				J		J Medium light gray (N6) wackestone; algal?, crinoids, articulated and disarticulated brachiopods; lower contact gradational.	
2.15	7.05			I		I Medium light gray (N6) wackestone; ferric oxide staining, exposure surfaces?; upper contact gradational.	
2.25	7.38					LOST CORE 5.0cm (2.0")	
2.30	7.55			H		H Medium light gray (N6) and light brown (5YR 5/6) wackestone; ferric oxide staining, exposure surface?.	
2.33	7.64					LOST CORE 5.0cm (2.0")	
2.38	7.81			G		G Grayish orange (10YR 7/4) wackestone with medium light gray (N6) interval 0.20dm below upper contact (20mm to 50mm in thickness); vuggy, fusulinids, articulated and disarticulated brachiopods, crinoids.	
2.50	8.20					LOST CORE 7.6cm (3.0")	
2.58	8.46			F		F Grayish orange (10YR 7/4) wackestone; fusulinids, articulated and disarticulated, porous; sharp lower contact.	
2.64	8.66			E		E Medium light gray (N6) wackestone; crinoids, articulated and disarticulated brachiopods, gastropods, skeletal fragments; upper contacts sharp.	
2.72	8.92					LOST CORE 5.0cm (2.0")	
2.78	9.09			D		D Medium light gray (N6) wackestone; porous, exposure surface?; crinoids, skeletal fragments.	
2.87	9.42					LOST CORE 5.0cm (2.0")	
2.92	9.58			C		C Medium light gray (N6) and grayish orange (10YR 7/4) wackestone; mottled, crinoids, fusulinids, disarticulated brachiopods.	
2.99	9.81					LOST CORE 5.3cm (2.1")	
3.05	10.01			B		B Grayish orange (10YR 7/4) wackestone; medium light gray (N6) argillaceous band (10mm in thickness) 0.35dm below upper contact; disarticulated brachiopods, skeletal fragments; lower contact sharp.	
3.26	10.70					15A Medium gray (N5) wackestone with medium olive gray (5Y 5/1) wackestone 0.50dm above lower contact; articulated and disarticulated brachiopods, crinoids; upper and lower contacts sharp.	
3.35	11.00			A	15		
				N		14N Grayish black (N2) bituminous mudstone; disarticulated brachiopods 0.90dm-0.00dm below upper contact; sharp upper contact.	
3.78	12.40				14		

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec. 33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level = 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
3	4					
3.98	13.46	20				LOST CORE 1cm (0.4") M Grayish black (N2) bituminous mudstone; lensoid and subrounded phosphate nodules (30mm x 9mm max.); lower contact gradational. L Dark gray (N3) calcareous mudstone; pyritized brachiopods and skeletal fragments; upper and lower contacts gradational. K Dark gray (N3) calcareous mudstone; pyritic; upper contact gradational and lower contact sharp. J Medium light gray (N6) mudstone; disarticulated brachiopods, skeletal fragments; sharp upper and lower contacts. I Medium dark gray (N4) calcareous mudstone; carbonaceous plant material; upper contact sharp and lower contact gradational. M/H Medium dark gray (N4) calcareous mudstone with very light gray (N8) calcareous layers (1-3mm in thickness), <i>Dunbarella</i>; gradational upper contact.
3.99	13.49					
		18				
		16				
4.18	13.71					
4.21	13.81					
		14				
		12				
		10				
4.59	13.96					
4.68	14.35					
		8				
5.21	15.09					
		6				
		4				
		2				
5.87	16.23					14

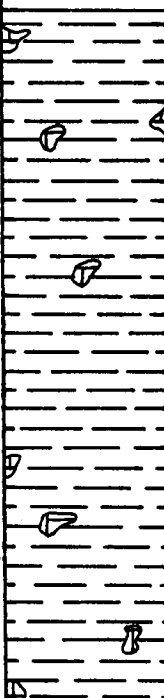
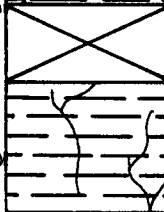
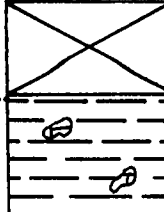
DEPTH		SCALE	BED INTERVAL	BED No.	Location Description:
18.57	18.17	18			KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
18.65	18.68	20			Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.
					Elevation: Ground level - 867' (from USGS reference elevation along road at this locality).
					Logged By: Erica Anderson, July 1992.
					4/G LOST CORE 7.6cm (3.0") Medium dark gray (N4) calcareous mudstone; pyritic bands (1-3mm in thickness) and nodules (2mm x 3mm avg.), calcareous layers (1-5mm in thickness) increasing in number upward, <u>Dunbarella</u>; sharp lower contact.

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	ft					
-7.37	-24.18	20		G		
		18				
		16				
		14				
		12				
		10				
		8				
		6				
-8.77	-28.77	4				
-8.98	-29.75	2				
-9.11	-29.89			D	14	
9.40	30.84					
						F Medium gray (N5) argillaceous wackestone with thin (1-3mm in thickness) light gray (N7) intervals; upper and lower contacts sharp. E Medium dark gray (N4) calcareous mudstone; calcareous layers (1-3mm in thickness) increasing in number upward, pyritic; sharp upper contact and gradational lower contact. 14/D Medium dark gray (N4) mudstone; finely laminated, pyritic nodules (5mm x 3mm avg.), calcareous layers (1-2mm in thickness), <i>Dunbarella</i>; upper contact gradational and lower contact sharp.

DEPTH		SCALE		Bed Interval	Bed No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	ft	m	ft			
9.40	30.97	2	20	D		
11.40	37.40					

DEPTH		SCALE		BED INTERVAL	BED NO.	Location Description:
M	Ft	M	Ft			KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
-11.40	-37.40					Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
		2	20			
			18			
			16			
			14			
			12	D		
			10			
			8			
			6			
			4			
-13.21	-43.24'			C		C Medium gray (N5) to Medium dark gray (N4) calcareous mudstone; articulated and disarticulated brachiopods, crinoids, skeletal fragments; sharp upper and lower contacts.
-13.82 -13.84'	-45.70' -45.72'	2		B		B Dark gray (N3) bituminous mudstone; sharp upper and lower contacts.
				A	14	14A Light olive gray (5Y 6/1) calcareous mudstone; articulated and disarticulated brachiopods (2mm x 22mm max.), crinoids, skeletal fragments; sharp upper and lower contacts.
-13.44	-44.10			E	13	13E Grayish black (N2) coal; calcite secondary mineralization, pyritic; sharp upper and lower contacts.
13.52	46.00					

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level = 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
B	F					
		2	20			
13.52	44.36			D		D Dark gray (N3) mudstone; carbonaceous plant material; gradational upper and lower contacts.
13.60	44.65			C		C Grayish black (N2) coal; calcite secondary mineralization; gradational upper contact and sharp lower contact.
13.64	44.75			B		B Medium dark gray (N4) mudstone; carbonaceous plant material; upper contact sharp and lower contact gradational.
13.79	45.08					13A Medium gray (N5) mudstone; carbonaceous plant material, medium dark gray (N4) carbonate clasts (3mm x 4mm avg.); gradational upper and lower contacts.
				A		
14.44	47.58				13	
				E		E Medium gray (N5) mudstone with medium yellowish orange (10YR 5/6) carbonate clasts, paleosol?; gradational upper contact and sharp lower contact.
14.79	48.52					12D Medium light gray (N6) argillaceous wackestone; medium yellowish orange (10YR 5/6) root traces?, paleosol?; sharp upper and lower contacts.
				D		
15.57	50.48				12	

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level = 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	f					
15.39	50.48	20				C Light gray (N7) mudstone; medium yellowish orange (10YR 7/6) carbonate clasts, paleosol?: sharp upper contact.
		18				
		16				
		14				
		12				
		10				
		8				
16.23	53.41	6				
16.38	53.74	4				
16.53	54.00	2				
16.67	54.14	0				B Light gray (N7) mudstone; root traces?, possible paleosol.
						12A Medium light gray (N6) mudstone; grayish yellow (5Y 8/4) carbonate clasts (5mm x 10mm avg.), carbonaceous plant material, paleosol?: lower contact gradational.
17.08	54.41				12	

LOST CORE 10.2cm (4.0")

LOST CORE 12.0cm (4.75")

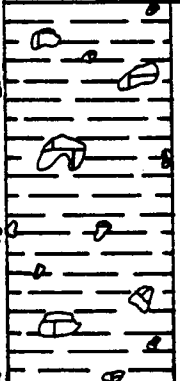
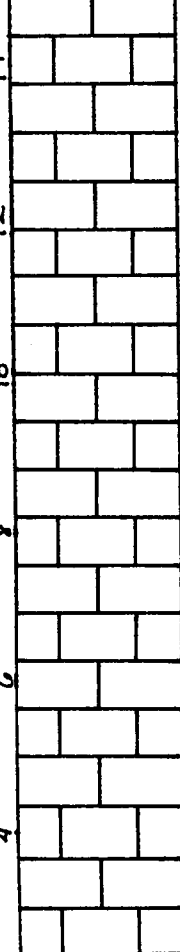
DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	ft					
17.08	56.04	20		A	12	
17.68	58.00	18				
17.76	58.27	16				
		14				
		12				
		10		B	11	C Medium light gray (N6) and medium dark gray (N4) mottled mudstone; carbonaceous plant material; gradational upper and lower contacts. B Medium dark gray (N4) mudstone; carbonaceous plant material; gradational upper contact and sharp lower contact. 11A Medium light gray (N6) mudstone; disarticulated brachiopods, skeletal fragments, pyritic; sharp upper and lower contacts.
18.36	60.24	8				
18.43	60.47	6				
18.98	62.58	4				
18.94	62.47	2				
18.92	62.40			A	10	C Grayish black (N2) coal; upper and lower contacts sharp. B Medium gray (N5) mudstone; carbonaceous plant material; sharp upper and lower contacts. 10A Brownish black (5YR 2/1) coal; calcite secondary mineralization; upper and lower contacts sharp.

DEPTH		SCALE	BED INTERVAL	BED No.	Location Description
m	ft	m			
					Location Description: KCS Area #2 - Along west side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level = 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
18.99	62.26	20			
19.11	62.70	18	C		C Medium dark gray (N4) mudstone; carbonaceous plant material; upper contact sharp and lower contact gradational.
19.24	63.16	16	B		B Medium olive gray (5Y 5/1) mudstone; carbonaceous plant material, skeletal fragments; gradational upper and lower contacts.
19.35	63.48	14	A	9	9 A Medium olive gray (5Y 5/1) and medium dark gray (N4) mottled mudstone; disarticulated brachiopods, skeletal fragments; gradational upper contact and sharp lower contact.
		12			
		10	N		N Yellowish gray (5Y 8/1) and light gray (N7) wackestone; algal?, crinoids, fusulinids, articulated and disarticulated brachiopods, <u>Paleotextularia</u> , chaetetids 0.45dm above lower contact, gastropods; "wispy" argillaceous intervals 1.20dm and 3.00dm below upper contact; upper contact sharp.
		8			
		6			
		4			
20.69	67.88	2			
20.82	68.00				LOST CORE 3.20cm (1.25")
21.93	71.94		M	8	8 M Yellowish gray (5Y 8/1) wackestone; algal?, crinoids, articulated and disarticulated brachiopods, fusulinids, ramose bryozoans, chaetetids 2.10dm below upper contact, ophthalimid foraminiferids; "wispy" argillaceous partings 0.50dm, 1.50dm, 2.80dm, and 4.00dm above lower contact; gradational lower contact.

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
M	FT					
-21.93	-71.95	2	20	M		Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad.
			18			Elevation: Ground level = 867' (from USGS reference elevation along road at this locality).
			16			Logged By: Erica Anderson, July 1992.
			14			
			12			
-21.93	-71.95		10	L		L Very light gray (N8) wackestone with alternating layers of medium dark gray (N4) and light gray (N7) mudstone; algal?, crinoids, opthalmid foraminiferids, disarticulated brachiopods, ramose bryozoans, "wispy"; gradational upper contact and sharp lower contact.
			8			K Light gray (N7) wackestone; algal?, crinoids, opthalmid foraminiferids, crystalline vug 0.6dm below upper contact on outside of core; "wispy" 0.40dm above lower contact, argillaceous "wispy" partings 0.65dm, 2.20dm, 2.80dm, and 3.15dm above lower contact; upper contact sharp and lower contact gradational.
-22.02	-72.24		6	K		J Very light gray (N8) wackestone; light olive gray (5Y 5/2) oil stains?, crinoids, articulated and disarticulated brachiopods, opthalmid foraminiferids, algal?, ramose bryozoans; gradational upper contact and sharp upper contact.
			4			I Medium light gray (N6) wackestone; crinoids, opthalmid foraminiferids, algal?, disarticulated brachiopods, fusulinids, ramose bryozoans; "wispy" argillaceous band (25mm in thickness) 1.10dm, 2.00dm, and 2.60dm above lower contact; sharp upper and lower contacts.
-22.34	-73.49		2	J		H Medium dark gray (N4) argillaceous wackestone; crinoids, fusulinids, articulated and disarticulated brachiopods, skeletal fragments; sharp upper and lower contacts.
-22.44	-73.62		0			8 G Medium light gray (N6) wackestone; algal?, opthalmid foraminiferids, ramose bryozoans, crinoids, articulated and disarticulated brachiopods; sharp upper and lower contacts.
			4	I		
			2			
-22.69	-74.44		0	H		
-22.72	-74.44		0			
22.95	75.30		0	G	8	

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side SE road near center of East line, no rock exposed at surface; surface casing to 6'2".
m	ft					
						Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.
						Elevation: Ground level - 867' (from USGS reference elevation along road at this locality).
						Logged By: Erica Anderson, July 1992.
-22.96	-75.30	20				
-23.10	-75.77	18		F		F Light gray (N7) wackestone; light olive gray (5Y 5/2) oil stains?; "wispy" argillaceous partings 0.20dm, 0.30dm, 0.45dm, and 1.40dm above lower contact; algal?, crinoids, ramose bryozoans, ophthalimid foraminiferids, disarticulated brachiopods; "wispy" argillaceous partings 0.20dm, 0.30dm, 0.45dm, and 1.40dm above lower contact; sharp upper and lower contacts.
		16				
		14		E		E Light gray (N7) wackestone; algal?, fusulinids (6mm x 4mm max.), crinoids, ophthalimid foraminiferids, disarticulated brachiopods; "wispy" argillaceous partings 0.50dm, 0.95, 3.70dm, 4.20dm, 4.40dm, and 5.00dm above lower contact; gradational upper contact and sharp lower contact.
		12				
-23.72	-77.82					D Pale yellowish brown (10YR 6/2) argillaceous wackestone; gypsum-filled vug, fusulinids, disarticulated brachiopods, skeletal fragments; sharp upper and lower contacts.
-23.77	-77.99	10		D		C Medium light gray (N6) wackestone; algal?, crinoids, disarticulated brachiopods; "wispy" argillaceous partings 1.65dm, 2.65dm, 3.30dm, 4.50dm, 5.10dm, and 5.40dm above lower contact; upper and lower contacts sharp.
		8				B Light gray (N7) wackestone; algal?, fusulinids, crinoids, articulated and disarticulated brachiopods, medium gray (N5) argillaceous bands 0.70dm and 1.45dm above lower contact (22.5mm and 5mm in thickness respectively); sharp upper and lower contacts.
		6		C		8 A Medium gray (N5) argillaceous wackestone; articulated and disarticulated brachiopods; upper and lower contacts sharp.
		4				
-24.39	-80.06					
		2		B		
-24.51	-80.51					
		2		A	8	
-24.73	-81.14					
-24.83	-81.46			E	7	7E Medium olive black (5Y 3/1) mudstone; disarticulated brachiopods; upper and lower contacts sharp.

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
m	ft					
						Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.
						Elevation: Ground level - 867' (from USGS reference elevation along road at this locality).
						Logged By: Erica Anderson, July 1992.
-24.85	-81.46	2	20	D		D Light gray (N7) wackestone; disarticulated brachiopods, skeletal fragments; sharp upper and lower contacts.
-25.03	-82.12	18		C		C Dark gray (N3) and olive gray (5Y 4/1) mottled mudstone, bioturbation?, <u>Chondrites?</u> burrows, disarticulated brachiopods; sharp upper contact and gradational lower contact.
-25.30	-83.00	16		B		B Grayish black (N2) bituminous mudstone; lensoid phosphate nodules (25mm x 5mm avg.), pyritic, <u>Dunbarella</u> , brachiopods 1.00dm below upper contact, <u>Chondrites?</u> burrows 0.50dm below upper contact, calcite secondary mineralization; upper and lower contacts gradational.
		14				7A Olive black (5Y2/1) mudstone; pyritic, disarticulated brachiopods, skeletal fragments, carbonaceous plant material; gradational upper contact and sharp lower contact.
		12				
		10				
		8				
-26.16	-85.81	6		A	7	
-26.24	-86.09			A	6	6A Brownish black (5YR 2/1) coal; sharp upper and lower contacts.
-26.37	-86.51	4				
		2		E		5E Medium olive black (5Y 3/1) calcareous mudstone; carbonate clasts (3mm x 5mm max.), pyritic, carbonaceous plant material; upper contact sharp.
-26.75	-87.78				5	LOST CORE 6.3cm (2.5")
-26.82	-88.00					

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	ft					
-2.82	-88.00	20		D		D Medium olive gray (5Y 5/1) to olive gray (5Y 4/1) calcareous mudstone; carbonate clasts (5mm x 7mm max.), carbonaceous plant material, pyritic; gradational lower contact.
-27.32	-89.63	16		C		C Medium olive gray (5Y 4/1) mudstone with medium light gray (N6) wackestone; fusulinids; upper and lower contacts sharp.
-29.42	-89.76	14		B	5A	B Light olive gray (5Y 6/1) wackestone; articulated and disarticulated brachiopods, crinoids, fusulinids, opthalmid foraminiferids, upper contact sharp and lower contact gradational. 5A Medium olive gray (5Y 7/1) wackestone; disarticulated brachiopods, crinoids, skeletal fragments; upper contact gradational and lower contact sharp.
		12				
		10				
		8				
		6		A	5	
-28.71	-94.20	2		E	4	4E Medium light gray (N6) calcareous mudstone; disarticulated brachiopods, skeletal fragments; sharp upper contact and gradational lower contact.
-28.80	-94.69					
-28.93	-94.91					

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
M	FT					
		20				Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.
		18				Elevation: Ground level = 867' (from USGS reference elevation along road at this locality).
25.92	94.91					Logged By: Erica Anderson, July 1992.
		16		D		
27.10	95.49					
		14		C		D Medium gray (N5) and medium greenish gray (5GY 8/1) mottled mudstone; bioturbation?; gradational upper and lower contacts.
		12				C Light olive gray (5Y 6/1), medium gray (N5), and medium dark gray (N4) mudstone; subrounded to lenticular phosphate nodules (30mm x 10mm max.), pyritic; upper and lower contacts gradational.
29.38	96.39					B Grayish black (N2) bituminous mudstone; lenticular pyritic?/sideritic? and phosphatic nodules (23mm x 2mm avg.); upper and lower contacts gradational.
		10		B		4A Grayish black (N2) bituminous mudstone; finely laminated, thin (1-3mm in thickness) light gray (N7) calcareous layers; gradational upper contact and sharp lower contact.
		8				
30.05	98.59			A	4	
30.16	98.95					
		6		A	3	3A Brownish black (5YR 2/1) coal; calcite secondary mineralization; upper and lower contacts sharp.
		4				
30.46	99.13					
		2		K		ZK Medium dark gray (N4) mudstone; pyritic nodules (5mm x 3mm avg.), carbonaceous plant material; upper contact sharp and lower contact gradational.
30.77	100.95				2	

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ator #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2".
m	ft					
32.99	108.25	20				Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad.
		18				Elevation: Ground level = 867' (from USGS reference elevation along road at this locality).
		16				Logged By: Erica Anderson, July 1992.
		14				
		12				
		10				
31.79	104.25	10				
		8				
32.12	105.36	8				
		6				
32.40	106.30	6				
		4				
		2				
32.91	107.98	2				

- J Light gray (N7) to medium gray (N5) calcareous mudstone; medium dark gray (N4) and yellowish gray (5Y 8/1) carbonate clasts (8mm x 12mm avg.) increasing in number upward, possible paleosol, calcite secondary mineralization; gradational upper and lower contacts.
- I Light gray mudstone; calcite secondary mineralization at upper contact; gradational upper and lower contact.
- H Light gray mudstone; pyritic; upper and lower contacts gradational.
- ZG Medium gray (N5) and light gray (N7) mottled mudstone; lensoid to subrounded pyritic nodules (17mm x 7mm max.); upper contact gradational.

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
m	ft					
-32.91	-108.98	20				LOST CORE 1.9cm (0.75") F Medium light gray (N6) and medium dark gray (N4) mottled mudstone; pyritic, carbonate clasts, possible paleosol; lower contact gradational. E Dark gray (N3) mudstone; lensoid sideritic?/pyritic? nodules (45mm x 19mm max.), pyritic; gradational upper and lower contacts. D Medium dark gray (N4), medium gray (N5), and dark yellowish brown (10YR 4/2) thinly laminated mudstone; lensoid pyritic nodules (42mm x 3mm max.); sharp upper contact and gradational lower contact. C Medium light gray (N6) and pale yellowish brown (10YR 6/2) mudstone; finely laminated, subrounded pyritic nodules (18mm x 10mm max.); upper and lower contacts gradational. B Light gray (N7) siltstone; subrounded pyritic nodules (26mm x 16mm max.), pyritic; gradational upper and lower contacts. A Medium gray (N5) mudstone; finely laminated, <u>Dunbarella</u>; gradational upper and lower contacts.
-32.95	-108.04	18				
-33.25	-109.09	16				
		14				
-33.68	-110.50	12				
		10				
-33.94	-111.35	8				
		6				
-34.37	-112.76	4				
		2				
-34.64	-113.65					2
-34.83	-114.27					

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas; Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
M	FT	M	FT			
-34.33	-114.27	2	20	C		C Light gray (N7) siltstone; subrounded pyritic nodules (8mm x 5mm max.); gradational upper and lower contacts.
-36.25	-118.64		18			B
-37.35	-119.98		16	A		
			14			
			12			
			10			
			8			
			6			
			4			
			2			
38.96	127.21				1	

DEPTH		SCALE		BED INTERVAL	BED No.	Location Description: KGS - Ater #2 - Along east side of road near center of East line; no rock exposed at surface; surface casing to 6'2". Location: SW 1/4, SE1/4, Sec.33, T.25S, R.24E., Bourbon County, Kansas: Marmaton, Kansas 1958 7.5' Quad. Elevation: Ground level - 867' (from USGS reference elevation along road at this locality). Logged By: Erica Anderson, July 1992.
3	17	3	17			
20.96	121.26	2	20	A		
38.96	127.83					