

**KANSAS GEOLOGICAL SURVEY
OPEN-FILE REPORT 2001-12**

FIELD GEOLOGY MAPS
CRAWFORD COUNTY, KANSAS

Preliminary Field Geology Maps for
Brazilton, Hepler, Porterville, Walnut
1: 24,000-scale quadrangles

By

R. R. West
R. S. Sawin

Disclaimer

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FIELD GEOLOGY MAPS CRAWFORD COUNTY, KANSAS

Preliminary Field Geology Maps for

**BRAZILTON
HEPLER
PORTERVILLE
WALNUT**

1:24,000-Scale Quadrangles

Ronald R. West and Robert S. Sawin

**Kansas Geological Survey
Open-file Report 2001-12**

CRAWFORD COUNTY QUADRANGLE MAPS

The following four quadrangle maps are photocopies of field maps submitted by the Kansas Geological Survey as part of the STATEMAP Agreement #00HQAG0055 for FY00 (May 1, 2000 to April 30, 2001). The following four quadrangles form Kansas Geological Survey Open-File Report 2001-12 "Preliminary Geologic Field Maps of portions of Crawford County, Kansas". In addition to the field maps, a report is also included in the open-file report and with these deliverables, that includes a general stratigraphic section, and locations of measured stratigraphic sections that were utilized in the mapping of the enclosed quadrangles.

Quadrangles included in the FY99 mapping effort--

Complete Quadrangle

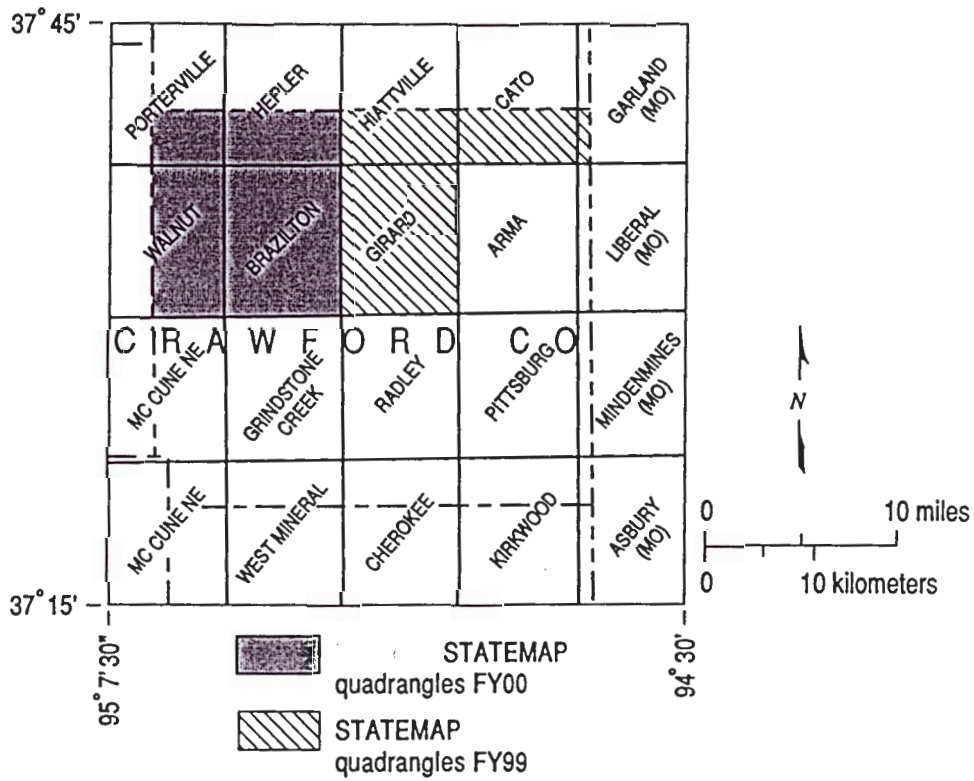
Brazilton

Partial Quadrangles

Hepler

Porterville

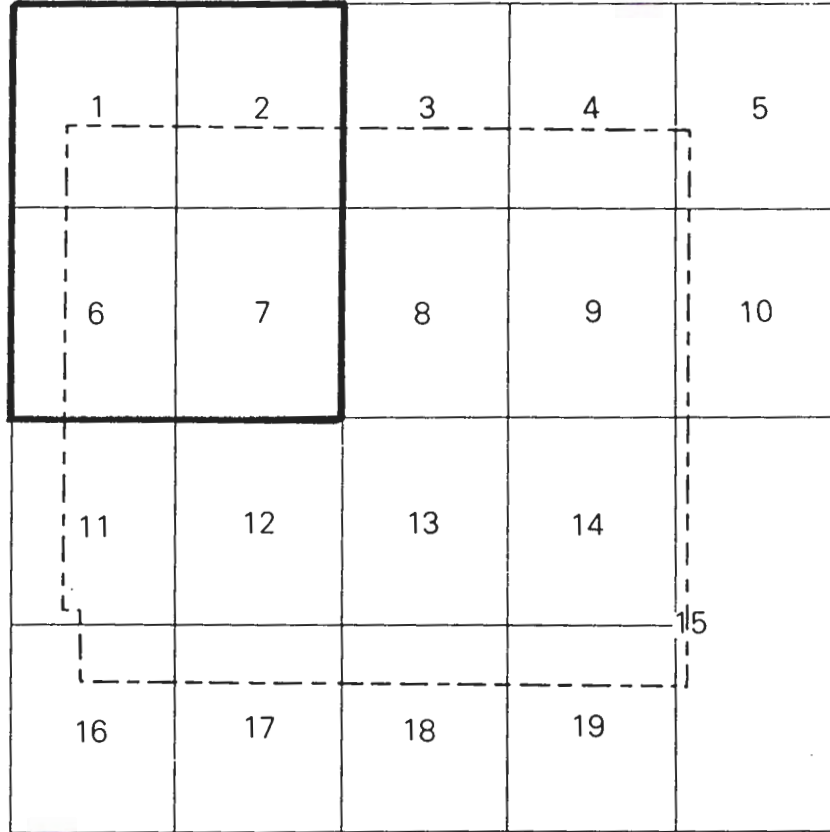
Walnut



Quadrangle maps covering Crawford County with area mapped during FY99, and deliverables of the new mapped area for FY00.

CRAWFORD COUNTY, KANSAS

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Copies of the field maps are open-filed at the Kansas Geological Survey, Lawrence, Kansas.

LEGEND

IT IS IMPORTANT TO NOTE THAT THESE MAPS INDICATE LITHOSTRATIGRAPHIC UNITS ONLY. NO TEMPORAL, GENETIC, OR RELATED DEPOSITIONAL ASPECTS ARE MEANT OR IMPLIED.

The stratigraphic sequence in this report extends from siliciclastic rocks in the Labette Shale (Marmaton Group) to the mudstones of the Galesburg Shale (Kansas City Group). Overlying these Pennsylvanian rocks are Quaternary alluvium and terrace deposits that are mapped as Qal.

Terminology on the left side of the Composite Lithologic Sequence is that of Zeller (1968), with one exception. The Holdenville Shale has been divided into the Memorial Shale below and the Lost Branch Formation above (Heckel, 1991). On the right side of this sequence are the units shown on the maps.

The following lithostratigraphic contacts, from lowest to highest, were mapped in the Crawford County quadrangles of this report:

- Top of Anna Shale Member/base of Myrick Station Limestone Member*
- Top of Laberdie Limestone Member (Pawnee Limestone)/base of Bandera Shale
- Top of Bandera Shale/base of Altamont Limestone
- Top of Altamont Limestone/base of Nowata Shale
- Top of Hertha Limestone/base of Ladore Shale
- Top of Ladore Shale/base of Swope Limestone
- Top of Swope Limestone/base of Galesburg Shale

Qal = alluvial deposits were mapped using the Soil Survey of Crawford County, Kansas (Rott, 1973). Holocene alluvial deposits five feet or greater in thickness were included in this unit. Alluvial deposits include sand, gravel, silt, and clay that was deposited on floodplains by streams, creeks, and rivers.

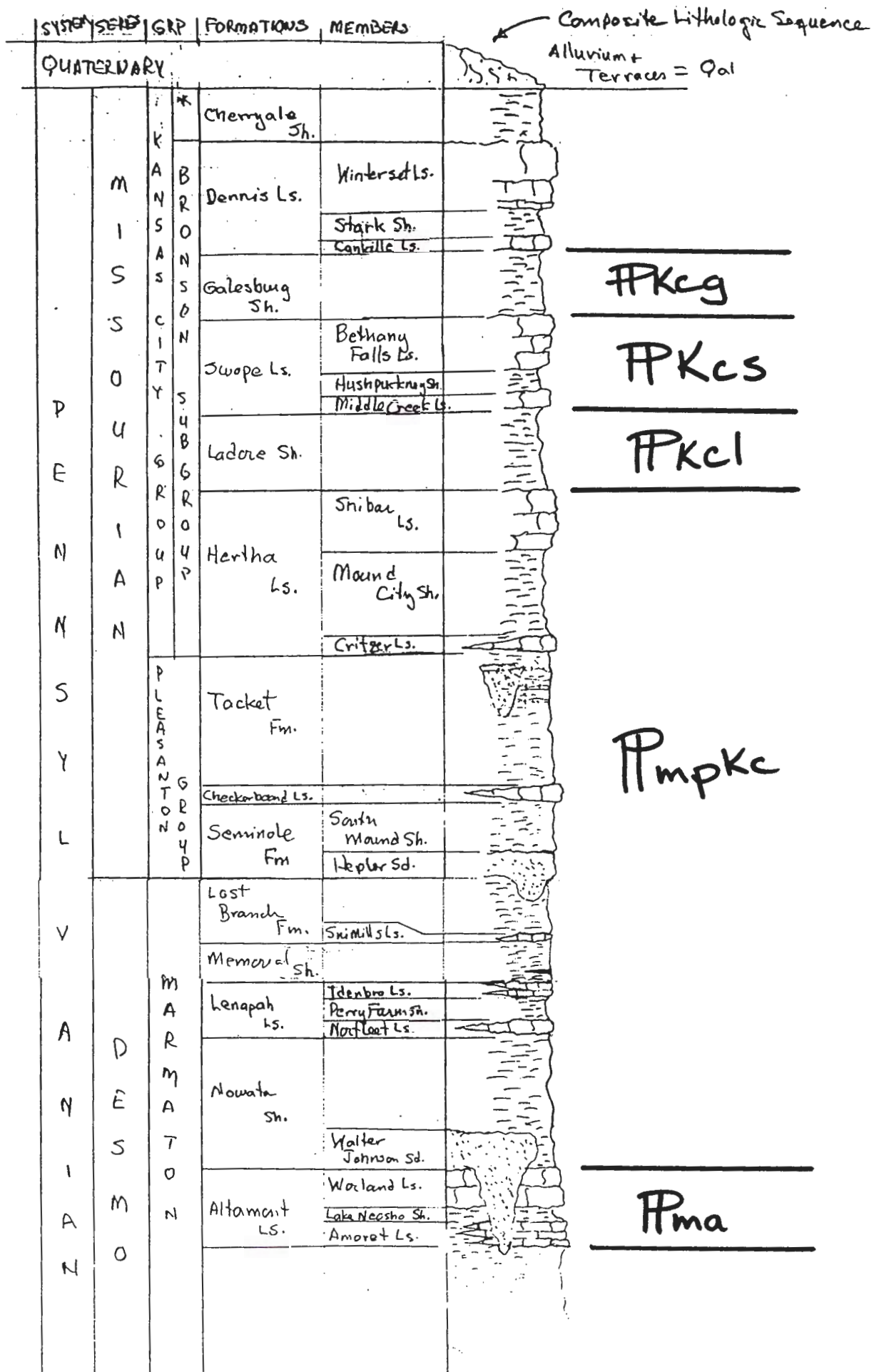
Ptc = coal strip pit

Ptl = limestone quarry

Ptss = sandstone quarry

Ptg - gravel pit

* Stratigraphically the Anna Shale Member is recognized as the basal member of the Pawnee Limestone, however, our studies do not support the mappability of the base of the Anna Shale Member (Pawnee Limestone)/ top of the Labette Shale. We found the thickness of the Anna to be variable, sometimes absent, and often underlain by a black to very dark gray mudrock/shale of the uppermost Labette, making a reliable (i.e. mappable) contact questionable at best. Since formations are defined by the North American Code of Stratigraphic Nomenclature as mappable lithostratigraphic units, we would propose that the Pawnee Limestone be defined to exclude the Anna and that the Anna be included in the Labette Shale.



PKeg

PKcs

PKcl

Pmpkc

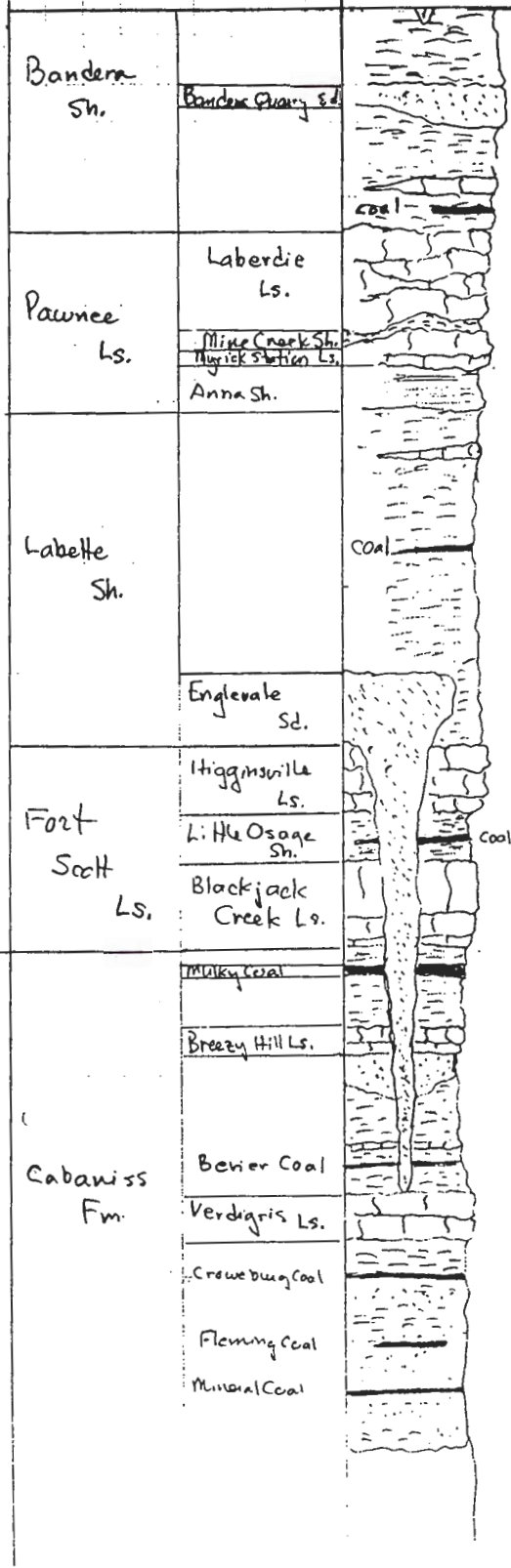
Pma

* Cherryvale Sh is the lowest formation of the Permian Subgroup

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Pmb

Pmp

Pml

REFERENCES

- Rott, D.E., Swanson, D.W., and Jorgensen, G.N., Jr., 1973, Soil Survey of Crawford County, Kansas: U.S. Department of Agriculture, Soil Conservation Service and Kansas Agricultural Experiment Station, 50 p., 48 maps.
- Jewett, J. M., 1945, Stratigraphy of the Marmaton Group, Pennsylvanian, in Kansas: Kansas Geological Survey Bulletin 58, 148 p.
- Heckel, P. H., 1991, Lost Branch Formation and Revision of Upper Desmoinesian Stratigraphy along Midcontinent Pennsylvanian Outcrop Belt: Kansas Geological Survey Geology Series 4, 67 p.
- Howe, W. B., 1956, Stratigraphy of Pre-Marmaton Desmoinesian (Cherokee) Rocks in Southeastern Kansas: Kansas Geological Survey Bulletin 123, 132 p.
- Zeller, D. N., 1968, The Stratigraphic Succession in Kansas: Kansas Geological Survey Bulletin 189, 81 p.

BRAZILTON QUADRANGLE - CRAWFORD COUNTY

EXPLANATION - CONTROL POINTS FOR THE BOURBON COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER C REFER TO MEASURED SECTIONS IN THE CRAWFORD COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER L REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS CR ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATIONS.

C-16 = Altamont (Amoret) Limestone and mudrock below in creek bank North of bridge, measured and described by J. M. Jewett in 1941; NOT FOUND but reasonable given our present investigations; near Center of SE1/4, SE1/4, Sec. 23, T.28S., R.22E., Crawford Co., Kansas.

C-17 = Bandera sandstone and underlying mudrocks along banks of West flowing creek on the East side of Kansas Highway 3, measured and described by J. M. Jewett in 1939; OBSERVED; near Center of West line of NW1/4, SE1/4, Sec. 14, T.28S., R.22E., Crawford Co., Kansas.

C-18 = Altamont Limestone in road ditch on East side of Kansas Highway 3, 0.2 miles South of the Center of North side of Sec. 14, T.28S., R.22E., Crawford Co., Kansas; measured and described by J. M. Jewett in 1939; OBSERVED and inferred base of Altamont Limestone at 948 feet (2 feet of Worland limestone and 2 feet of Lake Neosho shale).

C-37 = Exposure of mudrocks, coal (Lexington) and underclay of the Labette Shale along the south bank of Lightning Creek just south of bridge over Kansas Highway 57; near Center of North line, Sec. 21, T.29S., R.23E., Crawford Co., Kansas; measured and described by J. M. Jewett in 1939.

C-38 = See CR-156 below

C-39 = Exposure of lower Labette Shale and upper beds of Fort Scott (Higginsville) Limestone in and along Lightning Creek on the North side of Kansas Highway 57; near Center of South line, Sec. 16, T.29S., R.23E., Crawford Co., Kansas; measured and described by J. M. Jewett probably in 1939; NOT FOUND.

C-41 = Exposure of Pawnee Limestone where there is little or no mudrock between the two limestone members of this formation here and at nearby localities as noted by J. M. Jewett who measured and described, in 1939, the rocks exposed in a W.P.A. Quarry at this site; near Center of NW1/4, NW1/4, Sec. 9, T.29S., R.23E., Crawford Co., Kansas.

CR-151 = Top of Anna base of Pawnee (Myrick Station) Limestone in road ditch on both sides of North-South road at 960 feet; approximately 200 feet South of the Center of West line, Sec. 22, T.29S., R.23E., Crawford Co., Kansas.

CR-151A = Top of Anna base of Pawnee (Myrick Station) Limestone in road ditch on both sides of North-South road at 960 feet; near Center of west line of NW1/4, SW1/4, Sec. 22, T.29S., R.23E., Crawford Co., Kansas.

CR-152 = Exposure in a field along North bank of Lightning Creek of interval similar to that seen at C-37 (Labette Shale); 500 feet north and 300 feet West of the SE cor., Sec.20, T.29S., R.23E., Crawford Co., Kansas.

CR-153 = Englevale Sandstone in road ditch on North side of road; near Center of South line of Sec. 20, T.29S., R.23E., Crawford Co., Kansas.

CR-154 = Top of Anna base of Pawnee (Myrick Station) Limestone in drainage on North side of road at 939 feet; approximately 800 feet West of the SE cor., Sec. 19, T.29S., R.23E., Crawford Co., Kansas.

CR-155 = Loose blocks, float, of Myrick Station limestone in ditch on South side of road; near Center of North line of Sec. 30, T.29S., R.23E., Crawford Co., Kansas.

CR-156 = Top of Anna shale/base of Pawnee (Myrick Station) Limestone at change in road grade at 930 feet; approximately 1100 feet East of SW cor., Sec. 19, T.29S., R.23E., Crawford Co., Kansas; same as Jewett's C-38.

CR-157 = Pawnee (Laberdie) Limestone in road ditches on both sides of road; approximately 900 feet South of NW cor., Sec.19, T.29S., R.23E., Crawford Co., Kansas.

CR-157A = Quarry in Pawnee (Laberdie) Limestone on West side of road; near Center SE1/4, SE1/4, NE1/4, Sec. 24, T.29S., R.22E., Crawford Co., Kansas.

CR-158 = Pawnee (Laberdie) Limestone exposed in drainage south of Kansas Highway 57, probably near the top of the Pawnee Limestone; KDOT Bridge Number 57-19-7.40 profile; just South of Center of NE1/4, NW1/4, Sec. 24, T.29S., R.22E., Crawford Co., Kansas.

CR-159 = Quarry in Pawnee (Laberdie) Limestone on East side of road; near Center SW1/4, NW1/4, SW1/4, Sec. 24, T.29S., R.22E., Crawford Co., Kansas.

CR-160 = Sandstone (Bandera) in road; near Center of South line of SE1/4, SW1/4, SW1/4, Sec. 22, T.29S., R.22E., Crawford Co., Kansas.

CR-162 = Base of Altamont Limestone? at 1010 feet in road (capping hill) with silty, sandy mudstone below; approximately 200 feet South of Center of West line of SW1/4, Sec.11, T.29S., R.22E., Crawford Co., Kansas.

CR-163 = Loose blocks, float, of Myrick Station limestone on North side of road at 970 feet; approximately 850 feet West of SE cor., Sec. 9, T.29S., R.23E., Crawford Co., Kansas.

CR-164 = Exposure of what appears to be Pawnee (Myrick Station) Limestone in field about 1/8 mile East of road; near Center of NW1/4, SW1/4, Sec. 10, T.29S., R.23E., Crawford Co., Kansas.

CR-165 = Similar to CR-164 (Pawnee Limestone) but exposures better and visible on both sides of road; approximately 300 feet North of Center of West line, Sec. 10 and East line of Sec. 9, T.29S., R.23E., Crawford Co., Kansas.

CR-166 = Exposure similar to that at CR-165 (Pawnee Limestone) at 990 feet; near Center of South line of SW1/4, SW1/4, SE1/4, Sec. 10, T.29S, R.23E., Crawford Co., Kansas.

CR-167 = Pawnee (Laberdie) Limestone is exposed in the drainages on both sides of the road and is lithologically like that described by Jewett for the upper Pawnee limestone at C-41; near Center of West line of NW1/4, NW1/4, Sec. 8, and near Center of East line of NE1/4, NE1/4 Sec. 7, T.29S., R.23E., Crawford Co., Kansas.

CR-168 = Similar to exposure at CR-167 but also with blocks of Myrick Station limestone; near Center of NE1/4, NW1/4, NW1/4, Sec. 8, and near Center of SE1/4, SW1/4, SW1/4, Sec. 5, T.29S., R.23E., Crawford Co., Kansas.

CR-169 = Exposure similar to that at CR-168 but with approximately two feet of limestone in creek bank on East side of road; near Center of North 1/2, Sec. 8, T.29S., R.23E., Crawford Co., Kansas.

CR-169A = Laberdie limestone overlies directly the Myrick Station limestone with no mudrock between the two; top of Anna shale/base of Pawnee (Myrick Station) Limestone at approximately 937 feet along creek bank in field on East side of road; slightly West of the Center of NE1/4, SW1/4, NE1/4, Sec. 8, T.29S., R.23E., Crawford Co., Kansas.

CR-170 = Top of Anna shale/base of Pawnee (Myrick Station) Limestone at approximately 950 feet in field on South side of road, good exposure of thin bedded limestone along hillside and black mudrock (Anna) and gray mudrock (Labette) below limestone; near Center of North line of NE1/4, NE1/4, Sec. 5, T.29S., R.23E., Crawford Co., Kansas.

CR-171 = Exposure of Pawnee (Laberdie) Limestone in road at 963 feet; Center of North line, Sec. 5, .29S., R.23E., Crawford Co., Kansas.

CR-172 = Exposure of Pawnee (Laberdie) Limestone on East side of road; Center West line SW1/4, SW1/4, sec. 5, T.29S., R.23E., Crawford Co., Kansas.

CR-173 = Limestone exposed in road, possibly Altamont?; approximately 250 feet West of SE cor., Sec. 36, T.28S., R.22E., Crawford Co., Kansas.

CR-174 = Limestone exposed in road, possibly near the base of the Altamont? at 1000 feet; approximately 100 feet West of SE cor., Sec. 35, T.28S., R.22E., Crawford Co., Kansas.

CR-175 = Sandstone in road, Bandera; approximately 400 feet East of Center of South line of Sec. 35, T.28S., R.22E., Crawford Co., Kansas.

CR-176 = Sandstone in road, Bandera; approximately 1000 feet East of Center of South line of Sec. 34, T.28S., R.22E., Crawford Co., Kansas.

CR-177 = Exposure like that at CR-174 with possibly base of Altamont at 981 feet; approximately 500 feet West of CR-176 just West of Center of South line of SW1/4, Sec. 34, T.28S., R.22E., Crawford Co., Kansas.

CR-178 = Thin bedded sandstone, Bandera?, in road ditch on West side of road; near Center of East line of NE1/4, NE1/4, Sec. 33, T.28S., R.22E., Crawford Co., Kansas.

CR-178A = Creek bank exposure of lithology described at CR-178; near Center of North line of NE1/4, NE1/4, Sec. 33, T.28S., R.22E., Crawford Co., Kansas.

CR-179 = Bandera Sandstone in road; near Center of North 1/2, NW1/4, Sec. 27, T.28S., R.22E., Crawford Co., Kansas.

CR-180 = Thin bedded sandy silty mudrock (Bandera) in road ditch and along drainage on North side of road; approximately 100 feet East of SW cor., Sec. 25, T.28S., R.22E., Crawford Co., Kansas.

CR-180A = Thin bedded sandy silty mudrock (Bandera) in road ditch and along drainage on South side of road; approximately 100 feet East of NW cor., Sec. 36, T.28S., R.22E., Crawford Co., Kansas.

CR-180B = Thin bedded sandy silty mudrock (Bandera) in road ditch and along drainage on North side of road; Center of South line SE1/4, SW1/4, Sec. 25, T.28S., R.22E., Crawford Co., Kansas.

CR-181 = Road and surrounding topography suggest Bandera bedrock; near Center of North line NW1/4, NW1/4, Sec. 32, T.28S., R.23E., Crawford Co., Kansas.

CR-182 = Dark gray to black, hard, dense, thin bedded to platy limestone as sometimes seen in the lower part of the Bandera; approximately 300 feet North and 200 feet East of SW cor., Sec. 28, T.28S., R.23E., Crawford Co., Kansas.

CR-183 = Possibly CLOSE to the top of the Pawnee (Laberdie) Limestone at 960 feet in road; approximately 900 feet South of Center of West line of Sec. 34, T.29S., R.23E., Crawford Co., Kansas.

CR-184 = Possibly CLOSE to the Altamont Limestone at 995 feet in road; approximately 100 feet West of SE cor., Sec. 8, T.29S., R.23E., Crawford Co., Kansas.

CR-185 = Sandstone, Bandera, in road; near Center of West 1/2, Sec. 29, T.28S., R.23E., Crawford Co., Kansas.

CR-186 = Thin bedded sandstone in drainage on both sides of road; approximately 200 feet North of Center of West line of Sec. 29 and North of the Center of East line of Sec. 30, T.28S., R.23E., Crawford Co., Kansas.

CR-187 = Close to the base of the Altamont Limestone in old quarry on West side of road at approximately 981 feet, lithologically like the limestone at CR-184; near Center of East line of NE1/4, NE1/4, Sec. 30, T.28S., R.23E., Crawford Co., Kansas.

CR-188 = Sandstone (Bandera?) in road; Center of West line of NE1/4, NE1/4, Sec. 20, T.28S., R.23E., Crawford Co., Kansas.

CR-189 = Area of loose limestone blocks, float, along stream in field North of road suggesting base of Altamont Limestone; just South and along, in an East-West direction, Center of SW1/4, SE1/4, Sec. 7, T.28S., R.23E., Crawford Co., Kansas.

CR-190 = Limestone in road at 959 feet, possibly near base of Altamont Limestone; Center South line of SE1/4, Sec. 12, T.28S., R.22E., Crawford Co., Kansas.

CR-191 = Large blocks of limestone, float, like that at C-18 in road ditch on North side of road at 948 feet; approximately 400 feet West of SE cor., Sec. 11, T.28S., R.22E., Crawford Co., Kansas.

CR-192 = Similar to exposure at CR-191; approximately 150 feet South of Center of West line of Sec. 18, T.28S., R.23E., Crawford Co., Kansas.

CR-193 = Altamont Limestone in the road and in place in road ditch on East side of road; near Center of East line of NE1/4, Sec. 24, T.28S., R.22E., Crawford Co., Kansas.

CR-194 = Limestone in road at 990 feet, possibly top of Altamont Limestone; Center of East line of Sec. 24, T.28S., R.22E., Crawford Co., Kansas.

CR-195 = Limestone blocks in road ditch North of road, looks like Altamont Limestone the base of which maybe near 976 feet; approximately 450 feet East of Center of South line of Sec. 24, T.28S., R.22E., Crawford Co., Kansas.

CR-196 = Sandstone float in road, Bandera; approximately 300 feet West of Center of South line of Sec. 24, T.28S., R.22E., Crawford Co., Kansas.

CR-197 = Exposure similar to the one at CR-195 with the base of the Altamont Limestone, two limestones with no intervening mudrock, top or base inferred to be near 976 feet; approximately 600 feet West of Center of South line of Sec. 24, T.28S., R.22E., Crawford Co., Kansas.

CR-198 = Sandstone, Bandera, exposed on both sides of road under the bridge on the South side of the stream with approximately 6 feet of Altamont Limestone exposed Southward in road ditch along the East side of the road; base of Altamont Limestone between 925 and 930 feet; approximately 100 feet North of Center of Sec. 22, T.28S., R.22E. Crawford Co., Kansas.

CR-295A = Sandstone, Bandera, in KDOT borehole on bridge profile on Kansas Highway 146; near SE cor., Sec. 15, T.28S., R.22E., Crawford Co., Kansas.

CR-295B = Base of limestone (Altamont?) in KDOT borehole at 918' on bridge profile on Kansas Highway 146; near SW cor., SE1/4, SW1/4, Sec/ 15, T.28S., R.22E., Crawford Co. Kansas

HEPLER QUADRANGLE - BOURBON CO.

EXPLANATION - CONTROL POINTS FOR THE BOURBON COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **B** REFER TO MEASURED SECTIONS IN THE BOURBON COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER **L** REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS **BB** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT. * = CRAWFORD CO. LOCALITIES.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATION

B-129 = Altamont and underlying mudrock; lower part of private road North of public road; SW corner of Sec. 34; T.26S., R.23E., Bourbon Co., Kansas. **Looks good, limestone at corner with sandstone North toward creek.**

B-207 = Lenapah to "Hepler" sandstone; North of Hepler, Kansas on Highway 39; near Center of Sec. 14, T.27S., R.22E., Bourbon Co., Kansas. **Could be accessible, check in winter.**

B-208 = Pleasanton to Hertha; Center of South line of Sec. 3, T.27S., R.22E., Bourbon Co., Kansas. **Same as BB-570 and Heinlen-44.**

BB-73 = Base of Altamont Limestone at 980'; Sawin Site #1.

HEPLER QUADRANGLE - CRAWFORD CO.

EXPLANATION - CONTROL POINTS FOR THE CRAWFORD COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER C REFER TO MEASURED SECTIONS IN THE CRAWFORD COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER L REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS CR ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATIONS.

CR-199 = Sandstone float in road; NE cor., Sec. 26, T. 27S., R.22E., Crawford Co., Kansas.

CR-200 = Sandstone in road; Center of North line Sec. 25, T.27S., R22.E., Crawford Co., Kansas.

CR-201 = Possible top of Altamont Limestone in road at 970 feet; approximately 300 feet West of Center of North line of Sec. 29, T.27S., R.23E., Crawford Co., Kansas.

CR-202 = Possible top of Altamont Limestone in road at 970 feet; Center of North line of Sec. 29, T.27S., R.23E., Crawford Co., Kansas.

CR-203 = Possible base of Altamont Limestone in road at 970 feet; NE cor., Sec. 29, T.27S., R.23E., Crawford Co., Kansas.

CR-204 = Sandstone, Bandera, in road ditch on East side of road at 950 feet; approximately 400 feet North of Center of West line of Sec. 28, T.27S., R.23E., Crawford Co., Kansas.

CR-205 = Possible base of Altamont Limestone at 968 feet in road; Center of West line of Sec. 28, T.27S., R.23E., Crawford Co., Kansas.

CR-206 = Thin limestone in drainage approximately 1/8 mile East of road, possibly indicated the top of Altamont Limestone at 980 feet; approximately 800 feet South and 400 feet East of Center of West line of Sec. 28, T.27S., R.23E., Crawford Co., Kansas.

CR-207 = Sandstone, Bandera, in road ditch East of road, contact with base of Altamont Limestone at 982 feet; handleveling to top of hill indicated at least 11 feet of Altamont Limestone, top of Altamont Limestone suggested at 993 feet; from NW cor. to the Center of the West line of Sec. 33, T.27S., R.23E., Crawford Co., Kansas; remainder of interval to the SW cor. of Sec. 33, T.27S., R.23E., Crawford Co., Kansas appears to be the Nowata Formation based on characteristics of the terrain.

CR-208 = Suggested base of Altamont Limestone at 972 feet in road ditch on South side of road; approximately 300 feet East of Center of North line of Sec. 33, T.27S., R.23E., Crawford Co., Kansas.

CR-209 = Thin bedded sandstone in East bank of drainage on both sides of road; near Center of North line, NE1/4, NW1/4, NE1/4, Sec. 33, T.27S., R.23E., Crawford Co., Kansas.

CR-210 = Suggested base of Altamont Limestone at 972 feet in road ditch on South side of road; Center of North line, NE1/4, Sec. 33, T.27S., R.23E., Crawford Co., Kansas.

CR-211 = Thin bedded sandstone in East bank of drainage on both sides of road; approximately 500 feet East of NW cor., Sec. 34, T.27S., R.23E., Crawford Co., Kansas.

CR-212 = Limestone in road at 985 feet, similar to the lower limestone of the Altamont Limestone; Center of North line, Sec. 34, T.27S., R.23E., Crawford Co., Kansas.

CR-213 = CR-71 = Platy limestone like that of the upper Altamont Limestone on both sides of the road in the Hiattville Quad. 0.35 miles South of NE cor., Sec. 34, T.27S., R.23E., Crawford Co., Kansas

CR-214 = Altamont Limestone in the Hiattville Quad at SW cor., Sec. 34, T.27S., R.23E., Crawford Co., Kansas.

CR-214A = Contact of thin, wavy bedded limestone with underlying yellowish brown mudrock; approximately 250 feet West of SE cor., Sec. 34, T.27S., R.23E., Crawford Co., Kansas in the Hiattville Quad.

CR-215 = Sandstone exposed in drainage South of road; approximately 150 feet West of Center of North line of Sec. 3, T.28S., R.23E., Crawford Co., Kansas.

CR-216 = Limestone in road and in field North of road, Altamont?, near the base of Altamont Limestone ???; Center of South line of SE1/4, SW1/4, SE1/4, Sec. 33, T.27S., R.23E., Crawford Co., Kansas.

CR-217 = Altamont Limestone in place in field North of road; approximately 300 feet West and 200 feet North of Center of South line of Sec. 29, T.27S., R.23E., Crawford Co., Kansas.

CR-218 = Thin, dense, black, fossiliferous limestone in road at 971 feet, Exline/Checkerboard?; Center of East line of Sec. 1, T.28S., R.22E., Crawford Co., Kansas.

CR-219 = Altamont Limestone exposed at 958 feet with approximately 11 feet of Altamont exposed in road ditch Eastward along drainage on the North side of road; approximately 200 feet East of SW cor., Sec. 1, T.28S., R.22E., Crawford Co., Kansas.

CR-220 = Sandstone in road; approximately 800 feet West of SE cor., Sec. 2, T.28S., R.22E., Crawford Co., Kansas.

CR-221 = Sandstone in road; near Center of North line of NE1/4, NE1/4, NW1/4, Sec. 27, T.27S., R.22E., Crawford Co., Kansas.

CR-221A = Sandstone and thin bedded, platy, silty mudrock exposed in road; approximately 200 feet East of Center of North line of Sec. 27, T.27S., R.22E., Crawford Co., Kansas.

CR-222 = Sandstone in road; Center of North line of NW1/4, Sec. 26, T.27S., R.22E., Crawford Co., Kansas.

PORTERVILLE QUADRANGLE - BOURBON CO.

EXPLANATION - CONTROL POINTS FOR THE BOURBON COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER **B** REFER TO MEASURED SECTIONS IN THE BOURBON COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER **L** REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS **BB** ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATIONS.

B-114 = upper Pleasanton through Hertha, what Jewett called Critzer we think are the "Bourbon Flags" , either the Bourbon Flag facies of the Critzer as recognized in Heckel & Watney manuscript or similar beds in the upper Mound City shale, also of the Heckel & Watney manuscript; Northwest corner of Sec. 33, T.26S., R.22E., Bourbon Co., Kansas.

B-170 = Sniabar, NOT Bethany Falls limestone exposed in old quarry faces on both sides of North-South road, top of Hertha (Sniabar) Limestone inferred at an elevation of about 1005'; Northeast corner of Sec. 11, T.27S., R.21E., Bourbon Co., Kansas.

B-209 = Cherty limestone (Sniabar) overlying foss. mudrock; base of Critzer? limestone at 1077' in road with Sniabar, not the top, at top of hill; SW corner of Sec. 17, T.27S., R.22E., Bourbon Co., Kansas.

B-210 = Sequence similar to that at B-209 (see site BB-796), cherty limestone identified as Schubert Creek (Sniabar); West of NE corner of Sec. 17, T.27S., R.22E., Bourbon Co., Kansas.

B-211 = Pleasanton to Hertha (cherty limestone); sandstone in road and road ditch on West side of road ("Hepler type") see measured section just South of the Center of East line of Sec. 24, T.27S., R.21E., Bourbon Co., Kansas.

BB-748 = Swope Limestone in road; near Center of West line of NW1/4, SW1/4. SW1/4, Sec. 2, T.27S., R.21E., Bourbon Co., Kansas.

BB-749 = Dennis Limestone (oolitic) in road just below elevation 1080'; near Center of West line of NW1/4, NW1/4, Sec. 2, T.27S., R.21E., Bourbon Co., Kansas.

BB-750 = Hard, dense, oolitic limestone exposed in road ditch on West side of road, upper surface smooth with circular depressions up to a decimeter or two in diameter some of which are stained very dark reddish black, top of Dennis (Winterset) Limestone inferred at 1080', Cherryvale - Chanute interval above; near Center of East line of SE1/4, NE1/4, Sec. 34, T.26S., R.21E., Bourbon Co., Kansas.

- BB-751 = Dennis Limestone in road, looks similar to that seen at BB-750; near Center of North line of NW1/4, NE1/4, Sec. 35, T.26S., R.21E., Bourbon Co., Kansas.
- BB-752 = Limestone in road, stratigraphically, at least topographically, higher than limestones at BB-750 and BB-751, limestone (Drum?) in Cherryvale Shale; near Center of North line of NW1/4, NE1/4, NE1/4, Sec. 35, T.26S., R.21E., Bourbon Co., Kansas.
- BB-753 = Dennis Limestone in road and in pond bank of West side of road, appears similar to limestone at BB-750; near Center of East line of SE1/4, NE1/4, Sec. 35, T.26S., R.21E., Bourbon Co., Kansas.
- BB-754 = Swope Limestone in field on West side of road, looks similar to limestone at BB-750, but possibly lower stratigraphically; just South of the Center of East line of NE1/4, SE1/4, Sec. 35, T.26S., R.21E., Bourbon Co., Kansas.
- BB-755 = Swope Limestone in road like that seen at BB-754; near Center of East line of NE1/4, NE1/4, Sec. 2, T.27S., R.21E., Bourbon Co., Kansas.
- BB-756 = Swope Limestone like that at BB-755 in road and field West of road; near Center of East line of Sec. 2, T.27S., R. 21E., Bourbon Co., Kansas.
- BB-757 = Hertha (Sniabar) Limestone in road at grade change and in drainage East and South of road; near Center of East line of SE1/4, Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.
- BB-758 = Near top of Hertha (Sniabar) Limestone in road at an elevation of about 1022'; near Center of East line of SE1/4, SE1/4, SE1/4, Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.
- BB-759 = Black, cherty soil in road ditch on East side of road; near Center of West line of NW1/4, NW1/4, Sec. 24, T.27S., R.21E., Bourbon Co., Kansas.
- BB-760 = Limestone in road and piles of chert cobbles along edges of field on North side of road; near weathered top of limestone, probably Swope at approx. 1035'; near Center of South line of Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.
- BB-761 = Hertha (Sniabar) Limestone in road, cherty soil on West side of road, possibly near the top of the limestone unit; near Center of East line of SE1/4, SE1/4, SE1/4, Sec. 22, T.27S., R.21E., Bourbon Co., Kansas.
- BB-762 = Large blocks of light colored, algal limestone on West side of road, not unlike the Sniabar limestone at the roadcut near Uniontown on Kansas Highway 3, top of two feet of Sniabar type limestone at approx. 998'; about 200 feet South of Center of East line of SE1/4, Sec. 22, T.27S., R.21E., Bourbon Co., Kansas.
- BB-763 = Possible top of Hertha (Sniabar) Limestone in road and in road ditch on the East side of road, extending back South from this site a few hundred feet; upper part of Sniabar limestone between 1000' and 1010';

about 200 feet North of Center of West line of NW1/4, SW1/4, Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-764 = Same part of limestone (upper part of Sniabar) as exposed at BB-763; about 300 feet North of Center of West line of SW1/4, NW1/4, Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-765 = Limestone exposed on West side of road just South of low water bridge, Hertha Limestone (lower Sniabar and upper Mound City of Heckel & Watney manuscript) at approx. 975'; slightly South of Center of East line of SE1/4, NE1/4, NE1/4, Sec. 22, T.27S., R.21E., Bourbon Co., Kansas.

BB-765A = Hertha (base of flaggy beds of upper Mound City Shale Member of Heckel & Watney manuscript Limestone at approx. 975' in road); about 200 feet North of Center of west line, NW1/4, NW1/4, Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-766 = Hertha (Sniabar) Limestone in road; about 300 feet South of NW corner, Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-766A = Sniabar limestone in placed on West side of road; near Center of West line of SW1/4, SW1/4, SW1/4, Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.

BB-767 = Hertha (Sniabar) Limestone rubble in fields on both sides of road; Center of North line of NE1/4, NW1/4, Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-768 = Hertha (Sniabar) Limestone in drainage on both sides of road; Center of North line of Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-768A = Contact of limestone at BB-769A and underlying mudrock (Mound City shale of Heckel & Watney manuscript) at approx. 978' in stream cut on South side of road; about 100 feet East and 250 feet South of Center of North line of Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

BB-769 = Ledge of Hertha (Sniabar/upper Mound City shale) Limestone along drainage on North side of road; Center of South line of SW1/4, SE1/4, Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.

BB-769A = Thin, regularly bedded, hard, dense, medium gray, fossiliferous (linoproductids conspicuous) limestone (upper Mound City Shale Member of Heckel & Watney manuscript), 10 to 15 feet thick in pond spillway on North side of road; about 100 feet West and 250 feet North of Center of South line of Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.

BB-770 = Hertha (Sniabar) Limestone in road; Center of South line of SW1/4, SE1/4, SE1/4, Sec.14, T.27S., R.21E., Bourbon Co., Kansas.

BB-771 = Chert gravels in road and in field Northwest of Section corner; SE corner of Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.

BB-772 = Large blocks of Sniabar-like limestone like those at BB-762 in drainage; Center of West line of SW1/4, SW1/4, Sec. 14, T.27S., R.21E., Bourbon Co., Kansas.

- BB-773 = Hertha (Sniabar) Limestone exposed in Rock Creek on West side of road; about 250 feet South of Center of West line of SW1/4, Sec. 11, T.27S., R.21E., Bourbon Co., Kansas.
- BB-773A = Old quarry on West side of road in Sniabar limestone, massive to thin, wavy bedded, fine to medium crystalline, light grey limestone with a diverse productid brachiopod assemblage, blady algal fragments, syringoporoid and solitary corals, inferred based of Sniabar limestone at approx. 965'; about 250 feet West of Center of East line of SE1/4, Sec. 10, T.27S., R.21E., Neosho Co., Kansas.
- BB-774 = Thin to medium bedded limestone (Sniabar) exposed in road and in creek bank West of road, possibly the same limestone as at B-170; near Center of East line of SE1/4, Sec. 10, T.27S., R.21E., Bourbon Co., Kansas.
- BB-774A = Inferred top of Hertha (Sniabar) Limestone at approx. 990' in road; near Center of West line of NW1/4, NW1/4, SW1/4, Sec. 21, T.27S., R.21E., Bourbon Co., Kansas.
- BB-775 = Inferred top of Swope (Bethany Falls) Limestone at approx. 1030' in road; near Center of West line of SW1/4, NW1/4, NW1/4, Sec. 11, T.27S., R.21E., Bourbon Co., Kansas.
- BB-775A = Oolitic limestone in road ditch on East side of road, top of Swope (Bethany Falls) Limestone inferred at 1030'; near Center of West line of SW1/4, SW1/4, Sec. 2, T.27S., R.21E., Bourbon Co., Kansas.
- BB-776 = Limestone float in stream on both sides of Kansas Highway 39, stair step topography, suggestive of limestones, Sniabar at this elevation, top of Hertha Limestone inferred at @ 1000'; near Center of North line of NW1/4, NE1/4, Sec. 11, T.27S., R.21E., Bourbon Co., Kansas.
- BB-777 = Limestone, Hertha (Sniabar), in drainage on both sides of Kansas Highway 39; about 200 feet West of Center of North line of Sec. 12, T.27S., R.21E., Bourbon Co., Kansas.
- BB-778 = Limestone (Swope, Bethany Falls) cobbles in fields on both sides of road; NW corner of Sec. 18, T.27S., R.22E., Bourbon Co., Kansas.
- BB-779 = Hertha (mostly Sniabar like) Limestone and possible Swope (Middle Creek) in road at grade change, similar to that seen at site B-211; near Center of West line of Sec. 19, T.27S., R.22E., Bourbon Co., Kansas.
- BB-780 = Hertha (Sniabar) Limestone at another grade change in road, top inferred near 1085'; near Center of West line of NW1/4, NW1/4, SW1/4, Sec. 19, T.27S., R.22E., Bourbon Co., Kansas.
- BB-781 = Sandstone ("Hepler") caps this hill; near Center of South line of SW1/4, Sec. 20, T.27S., R.22E., Bourbon Co., Kansas.
- BB-782 = Near top of Hertha (Sniabar) Limestone in road and in road ditches on both sides of road at 1060'; near Center of West line of NW1/4, NW1/4, NW1/4, Sec. 8, T.27S., R.22E., Bourbon Co., Kansas.

- BB-783 = Limestone, Swope, Bethany Falls, rubble in field East of road; NW corner of Sec. 5, T.27S., R.22E., Bourbon Co., Kansas.
- BB-784 = Large blocks of limestone like that at BB-783 (Bethany Falls) in road and road ditch South of road; near Center of North line of NW1/4, NE1/4, Sec. 5, T.27S., R.22E., Bourbon Co., Kansas.
- BB-785 = Limestone, Swope, Bethany Falls in field North of road; about 300 feet East of Center of North line of NW1/4, NE1/4, Sec. 5, T.27S., R.22E., Bourbon Co., Kansas.
- BB-786 = Limestone, Swope, Bethany Falls in field West of road; about 100 feet North of Center of East line of SE1/4, SE1/4, Sec. 32, T.26S., R.22E., Bourbon Co., Kansas.
- BB-787 = Limestone, Hertha, Sniabar, in field West of road; about 150 feet North of Center of East line of NE1/4, SE1/4, Sec. 32, T.26S., R.22E., Bourbon Co., Kansas.
- BB-788 = Base of Critzer limestone at 1030' in drainage West of road; near Center of East line of SE1/4, NE1/4, Sec. 32, T.26S., R.22E., Bourbon Co., Kansas.
- BB-789 = Hertha (Sniabar) Limestone in drainage West of road; about 200 feet North of Center of East line of NE1/4, Sec. 32, T.26S., R.22E., Bourbon Co., Kansas.
- BB-790 = Base of Swope (Middle Creek) Limestone exposed on both sides of drainage at an elevation of about 1050'; near Center of SE1/4, NW1/4, eNE1/4, Sec. 32, T.26S., R.22E., Bourbon Co., Kansas.
- BB-791 = Near, or part of that described for, site B-114; Critzer limestone "Bourbon Flag" (Hertha according to B-114); near Center of North line of NE1/4, NE1/4, NW1/4, Sec. 33, T.26S., R.22E., Bourbon Co., Kansas.
- BB-792 = Near, or part of that described for, site B-114; mostly limestone from here back to BB-791, top of Hertha (Sniabar) Limestone at @ 1060' and base of Critzer limestone at 1030'; near Center of North line of NE1/4, NW1/4, Sec. 33, T.26S., R.22E., Bourbon Co., Kansas.
- BB-793 = Limestone, interpreted as beds of upper Swope (Bethany Falls) Limestone in; about 500 feet South of Center of West line of Sec. 4, T.27S., R.22E., Bourbon Co., Kansas.
- BB-794 = Swope (Bethany Falls) Limestone in field East of road; near Center of West line of NW1/4, NW1/4, NW1/4, Sec. 9, T.27S., R.22E., Bourbon Co., Kansas.
- BB-795 = Hertha (Sniabar) Limestone exposed in West facing gully on East side of road, top of limestone at approx. 1075', base near 1060', thus approx. 15 thick; see Heckel & Watney manuscript, Figure 3, base of Swope (Middle Creek) Limestone inferred at @ 1085'; near Center of West line of SW1/4, NW1/4, SW1/4, Sec. 9, T.27S., R.22E., Bourbon Co., Kansas.

BB-796 = Top of Hertha (Sniabar) Limestone at @ 1075', with medium to dark gray, highly fossiliferous mudrock below in road ditch on South side of road; Sniabar limestone in road and road ditches on both sides of road to the top of hill; about 150 feet West of NE corner, Sec. 17, T.27S., R.22E., Bourbon Co., Kansas.

BB-797 = Base of two very thin limestone beds separated by very thin mudrock limestone at 1072' in drainage on Southeast side of road with top of Hertha (Sniabar) Limestone in road at @ 1080'; about 500 feet North and 300 feet East of Center of South line of SE1/4, Sec. 18, T.27S., R.22E., Bourbon Co., Kansas.

BB-798 = Sandstone (?) in road; near Center of North line of Sec. 24, T.27S., R.21E., Bourbon Co., Kansas.

BB-799 = Sandstone (?) in road and sandy type soil from BB-798 East to Section corner in stream bank; about 500 feet West of Center of North line of Sec. 24, T.27S., R.21E., Bourbon Co., Kansas.

BB-874 = Black, fissile shale in road ditch on North side of road at approx. 1035' = basal bed of Mound City Shale Member of Heckel & Watney manuscript (Figure 3); 0.2 mile East of SW corner, Sec. 9, T.27S., R.22E., Bourbon Co., Kansas.

PORTERVILLE QUADRANGLE - CRAWFORD CO.

EXPLANATION - CONTROL POINTS FOR THE CRAWFORD COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER C REFER TO MEASURED SECTIONS IN THE CRAWFORD COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER L REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS CR ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATIONS.

C-1 = Cherty limestone (Hertha) underlain by yellow clay shale, measured and described by J. M. Jewett in 1935; SW cor., Sec. 35, T.27S., R.21E., Crawford Co., Kansas.

C-2 = Limestone (Hertha) underlain by yellow clay shale, measured and describe by J. M. Jewett in 1935; just South of Center of west line of SW1/4, Sec. 25, T.27S., R.21E., Crawford Co., Kansas.

C-3 = Part of Hertha Limestone and underlying sequence, measured and described by J. M. Jewett in 1936; SE cor., Sec. 29, T.27S., R.22E., Crawford Co., Kansas.

C-15 = Swope Limestone to "basal Missourian" (Hepler) sandstone, measured and described by J. M. Jewett in 1935; Center of West line of SW1/4, Nw1/4, sec. 2, T.28S., R.21E., Crawford Co., Kansas.

CR-223 = BB-781

CR-224 = Cherty soil; near SW cor., Sec. 30, T.27S., R.22E., Crawford Co., Kansas.

CR-224A = Limestone cobbles in stream bank; along a line South for the Center of the North line of NE1/4, SW1/4, SW1/4 toward the Center of NE1/4, SW1/4, SW1/4, Sec. 30, T.27S., R.22E., Crawford Co., Kansas.

CR-225 = Terrain suggests area is underlain by a bedrock of silty, sandy mudrock; SE cor., T.27S., R.22E., Crawford Co., Kansas.

CR-226 = Terrain suggests area is underlain by a bedrock of silty, sandy mudrock; approximately 500 feet South of Center of East line of Sec. 30, T.27S., R.22E., Crawford Co., Kansas.

CR-227 = Sandstone exposed in road; North of C-3; Center of east line of SE1/4, Sec. 29, T.27S., R.22E., Crawford Co., Kansas.

CR-228 = Terrain suggests area is underlain by a bedrock of silty, sandy mudrock and sandstone; Center of East line, NE1/4, SE1/4, Sec. 32, T.27S., R.22E., Crawford Co., Kansas.

CR-229 = Terrain suggests area is underlain by a bedrock of silty, sandy mudrock and sandstone; Center of South line, SW1/4, Sec. 29, T.27S., R.22E., Crawford Co., Kansas.

CR-230 = Approximately 30 to 40 feet of sandstone and sandy, silty mudrock exposed along road ditch on South side of road from near Center of South line, SW1/4, SW1/4, SE1/4 to Walnut Creek near Center of South line SW1/4, SE1/4, SW1/4, Sec. 31, T.27S., R.22E., Crawford Co., Kansas.

CR-231 = Sandstone in road; approximately 1100 feet South of NE cor., Sec. 31, T.27S., R.22E., Crawford Co., Kansas.

CR-232 = Area of Section C-2, limestone, with mudrock below?, as described at top of hill in road ditch on both sides of road, lot of chert gravel in soil and along road, base of limestone (Sniabar?) in road at 1048 feet; approximately 300 feet South of Center of East line, SE1/4, Sec. 26, T.27S., R.21E., Crawford Co., Kansas.

CR-233 = Limestone in field North of road; approximately 950 feet East of SW cor., Sec. 23, T.27S., R.21E., Bourbon Co., Kansas.

CR-234 = About 6 feet of thin bedded, dark gray to black, fossiliferous limestone in drainage North of road, not top, no base, possibly Hertha (Sniabar) Limestone; Center of South line SW1/4, SW1/4, Sec. 26T.27S., R.21E., Crawford Co., Kansas.

CR-234A = Black, platy mudrock to fissile shale in southwest bank of stream, probably Mound City; approximately 400 feet North and 150 feet East of SW cor., Sec. 26, T.27S., R.21E., Crawford Co., Kansas.

CR-235 = Inferred base of Swope Limestone in road at 1045 feet; approximately 200 feet South of Center of West line of SW1/4, Sec. 35, T.27S., R.21E., Crawford Co., Kansas.

CR-236 = Top of Hertha Limestone inferred at 1010 feet in road with black platy to fissile shale exposed in field East of road below 1010 feet; inferred thickness of Hertha (Sniabar) Limestone of 16+ feet; approximately 900 feet South of NW cor., Sec. 35, T.27S., R.21E., Crawford Co., Kansas.

CR-237 = Sandy soil in road; approximately 200 feet West of Center of South line, Sec. 36, T.27S., R.22E., Crawford Co., Kansas.

CR-238 = Sandy soil in road; approximately 450 feet West of SW cor., Sec.2, T.28S., R.21E., Crawford Co., Kansas.

CR-239 = Inferred top of Hertha (Sniabar) Limestone at 1030 feet in road, area of Section C-1; approximately 500 feet East of SW cor., Sec.35, T.27S., R.21E., Crawford Co., Kansas.

CR-240 = Inferred top of Hertha (Sniabar) Limestone at 1030 feet in road; approximately 800 feet South of NW cor., Sec.2, T.28S., R.21E., Crawford Co., Kansas.

CR-241 = Sandstone in road, area of Section C-15; Center of West line, NW1/4, Sec. 2, T.28S., R.21E., Crawford Co., Kansas.

WALNUT QUADRANGLE

EXPLANATION - CONTROL POINTS FOR THE CRAWFORD COUNTY MAP ARE IDENTIFIED AS FOLLOWS:

(1) NUMBERS PRECEDED BY THE LETTER C REFER TO MEASURED SECTIONS IN THE CRAWFORD COUNTY, KANSAS BOOKS IN THE FILES OF THE KANSAS GEOLOGICAL SURVEY, NUMBERING BEGAN AT FIRST SECTION IN THE BOOK AND PRECEDED SEQUENTIALLY TO THE LAST SECTION;

(2) NUMBERS PRECEDED BY THE LETTER L REFER TO SITES FROM WHICH I HAVE COLLECTED GEOLOGICAL SPECIMENS; AND

(3) NUMBERS PRECEDED BY THE LETTERS CR ARE SITES EXAMINED AND EVALUATED SPECIFICALLY FOR THIS MAPPING PROJECT.

OBVIOUSLY, ANY GIVEN SITE MAY BE IDENTIFIED BY ANY ONE, TWO, OR ALL THREE OF THESE DESIGNATIONS.

Section 102 of Jewett, 1945 =

Section 103 of Jewett, 1945 =

C-10 = Quarry on the West side of road in the upper Altamont Limestone with yellow, clay shale below according to J. M. Jewett who measured and described it in 1939, Section 104 of Jewett, 1945; Center of East line of Sec. 36, T.28S., R.21E., Crawford Co., Kansas; this location is in a flood plain and hard to imagine that there was ever a quarry there, however limestones of the presumed Altamont are exposed in the bank of Walnut Creek just North of here at CR-274 at a lower elevation and limestones are exposed along the road just South of here at CR-273 at about the same elevation.

C-11 = Limestone identified as Tina (Amoret) and sequence below South of Walnut, Kansas where road turns, measured and described by J. M. Jewett probably in the later 1930's or early 1940's; SW cor., Sec. 26, T.28S., R.21E., Crawford Co., Kansas; the site located does not correspond to a turn in the road today, but the sequence and descriptions appear reasonable for this legal location, see CR-288.

C-12 = Cross-bedded limestone identified as Tina (Amoret) and sequence below South of first road South of Walnut, Kansas, measured and described by J. M. Jewett in 1941; near Center of NE1/4, Sec. 26, T.28S., R.21E., Crawford Co., Kansas; this legal description is in the West bank of Little Walnut Creek where the road South of Walnut, Kansas turns East, see CR-251.

C-13 = Limestone (Altamont?) and sequence below 1 mile South of Walnut, Kansas, measured and described by J. M. Jewett probably in the later 1930's or early 1940's; just South of NE cor., sec. 25, T.28S., R.21E., Crawford Co., Kansas; appears reasonable with limestone in road ditch on both sides of road at 920 feet and sandstone exposed below base of limestone; see CR-262.

C-14 = Limestone identified as basal part of upper Altamont and yellow clay shale with phosphatic concretions below, measured and described by J. M. Jewett in 1939; SE cor., Sec. 25, T.28S., R.21E., Crawford Co., Kansas; appears reasonable, see CR-263 and CR-264.

C-35 = Limestone identified as Tina (Amoret) with sandstones and mudrocks below, measured and described by J. M. Jewett in 1941; Center of SW1/4, SW1/4, Sec. 2, T.29S., R.21E., Crawford Co., Kansas; appears reasonable, see CR-288.

CR-242 = Terrain along road and surrounding area suggest bedrock of sandy, silty mudrock; approximately 300 feet South of Center of West line of Sec. 14, T.28S., R.21E., Crawford Co., Kansas.

CR-243 = Terrain along road and surrounding area suggest bedrock of sandy, silty mudrock; approximately 100 feet West of Center of North line of Sec. 14, T.28S., R.21E., Crawford Co., Kansas.

CR-244 = Thin bedded to platy silty, sandy, carbonaceous mudrock in road ditch on North side of road; approximately 650 feet East of NW cor., Sec. 13, T.28S., R.21E., Crawford Co., Kansas.

CR-245 = Approximately 2 dm. of thin bedded to platy, light to medium gray, dense, sub-lithographic, fossiliferous carbonate mudstone (Altamont?) exposed at 925 feet in stream bed on both sides of road and in field East of road; approximately 1000 feet North of SW cor., Sec. 7, T.28S., R.22E., Crawford Co., Kansas.

CR-246 = Limestone (Altamont?) similar to that at CR-245 in creek bed North of road at approximately 928 feet; approximately 200 feet North of Center of South line of SE1/4, Sec. 9, T.28S., R.22E., Crawford Co., Kansas.

CR-247 = Thin bedded to platy, orangish brown sandstone with low angle cross-beds and ripple marks in West bank of creek bed on the west side of road; according to the KDOT bridge 0.59 profile over Walnut Creek along the SE1/4, SE1/4 of Sec. 17, T.28S., R.22E. this is the Bandera Sandstone; along a diagonal from SW to NE in Center of NE1/4, SE1/4, SE1/4, Sec. 17, T.28S., R.22E., Crawford Co., Kansas.

CR-248 = Limestone (Altamont?) like that a CR-245 exposed in bed of stream on East side of road at 928 feet; exposed from near Center of West line of NW1/4 to near Center of South line of NW1/4, NW1/4, NW1/4, Sec. 16, T.28S., R.22E., Crawford Co., Kansas.

CR-249 = Approximately one foot of limestone (Altamont?) like that at CR-245 exposed in bed of stream on both sides of Kansas Highway 146; approximately 500 feet West of SE cor., Sec. 18, T.28S., R.22E., Crawford Co., Kansas.

CR-250 = Limestone (Altamont?) like that at CR-245 exposed in bed of Walnut Creek slightly below an elevation of 900 feet on both sides of Kansas Highway 146 just East of Walnut, Kansas; approximately 1600 feet West of SW cor. of Sec. 13, T.28S., R.21E., Crawford Co., Kansas.

C-251 = Base of calcarenitic limestone (Altamont?) similar to that described at C-12 is at 895 feet in the West stream bank of Little Walnut Creek, area of Section C-12 and the sequence described there is similar; just North of center of South line of SE1/4, Sec. 23 T.28S., R.21E., Crawford Co., Kansas.

CR-252 = Top of pedogenic limestone (Altamont) like that at CR-250 at 910 feet in drainage of West side of road; approximately 200 feet West of Center of N1/2, Sec. 24, T.28S., R.21E., Crawford Co., Kansas.

CR-253 = Possible sandstone in drainage on both sides of road; approximately 200 feet East of Center of South line of SW1/4, SE1/4, Sec. 19, T.28S., R.22E., Crawford Co., Kansas.

CR-254 = Base of Altamont Limestone? with sandstone below in road at 920 feet, beds of limestone capping hill to the North; approximately 950 feet West of SE cor., Sec. 19, T.28S., R.22E., Crawford Co., Kansas.

CR-255 = Same as CR-254 with contact of limestone (Altamont?) and sandstone at 920 feet, at least 12 feet of limestone on top of hill to the North; approximately 800 feet North of SE cor., Sec. 19, T.28S., R.22E., Crawford Co., Kansas.

CR-256 = Limestone (Altamont?) in creek bed West of road, surface of limestone like that at CR-252, elevation of this limestone surface is 911 feet and is somewhere within the Altamont Limestone?; approximately 300 feet South of Center of East line of Sec. 19, T.28S., R.22E., Crawford Co., Kansas.

CR-257 = Limestone (Altamont?) surface like that at CR-249 at 926 feet in ditch on both sides of road; approximately 400 feet South of NE cor., Sec. 19, T.28S., R.22E., Crawford Co., Kansas.

CR-258 = Terrain suggests bedrock of sandy, silty mudrock and sandstone; approximately 1100 feet South of Center of East line of Sec. 20, T.28S., R.22E., Crawford Co., Kansas.

CR-259 = Contact with limestone (Altamont?) and underlying sandstone at 942 feet, both contact and limestone are similar to those at CR-255 and the sandstone below the contact is well exposed ; approximately 850 feet North of SE cor., Sec. 29, T.28S., R.22E., Crawford Co., Kansas.

CR-260 = Silty, sandy mudrock exposed in drainage North of road; approximately 300 feet West of Center of South line of Sec. 28, T.28S., R.22E., Crawford Co., Kansas.

CR-261 = Contact of limestone (Altamont?) above and sandstone below in road at 925 feet with about 5 feet of limestone exposed on the East side of the road in an old trench silo; thin bedded, platy limestone with uppermost bed similar in some ways to the calcarenite at CR-251, upper surface of bed about a foot below the top looks pedogenic similar to those noted elsewhere in stream beds; approximately 250 feet North of SW cor., Sec. 29, T.28S., R.22E., Crawford Co., Kansas.

CR-262 = Thin bedded, platy limestone (Altamont?) in road ditch on East side of road and in the bed of stream of East side of road at 910 feet?; Center of West line of Sec. 30, T.28S., R.22E., Crawford Co., Kansas.

CR-263 = Limestone (Altamont?) in road at approximately 905 feet and in road ditches on both sides of road, similar to exposure at CR-262 and elsewhere, area

of Section C-14; approximately 800 feet South of Center of West line of Sec. 30, T.28S., R.22E., Crawford Co., Kansas.

CR-264 = Terrain suggests bedrock of sandy, silty mudrock and sandstone, area of Section C-14; Center of South line of SW1/4, SE1/4, Sec. 25, T.28S., R.21E., Crawford Co., Kansas.

CR-265 = Base of thin bedded, platy limestone (Altamont?) at approximately 896 feet in road; approximately 300 feet West of Center of South line of Sec. 26, T.28S., R.21E., Crawford Co., Kansas.

CR-266 = Similar to CR-265 with base of limestone (Altamont?) at 890? feet, area of Section C-11; approximately 100 feet South of NW cor., Sec. 35, T.28S., R.21E., Crawford Co., Kansas.

CR-267 = Base of limestone (Altamont?) at 900 feet with sandstone below in road; proximately 1000 feet North of SW cor., Sec. 35, T.28S., R.21E., Crawford Co., Kansas.

CR-268 = Same as at CR-267 with good exposures in road and vertical exposure of sandstone in drainage North of road, limestone exposed in ditches on both sides of road; Center of South line of SE1/4, SW1/4, Sec. 35, T.28S., R.21E., Crawford Co., Kansas.

CR-269 = Excellent exposure of limestone (Altamont?) above and sandstone below at 900 feet in road; Center of South line of Sec. 35, T.28S., R.21E., Crawford Co., Kansas.

CR-270 = Sandstone well exposed in drainage on both sides of road below 900 feet; near Center of NE1/4, NW1/4, NE1/4, Sec. 2, T.29S., R.21E., Crawford Co., Kansas.

CR-271 = Limestone (Altamont?) in road at 900 feet and above; approximately 500 feet East of SW cor., Sec. 1, T.29S., R.21E., Crawford Co., Kansas.

CR-272 = Same as CR-271; just North of Center of South line of Sec. 36. T.28S., R.21E., Crawford Co., Kansas.

CR-273 = Well exposed thin bedded, platy sandstones and sandy, silty mudrocks in stream on both sides of road with limestone (Altamont?) above 900 feet in road to the North; approximately 900 feet North of SE cor., Sec. 36, T.28S., R.21E., Crawford Co., Kansas.

CR-274 = Three plus feet of thin bedded, platy, algal, fossiliferous limestone (Altamont/Amoret?) exposed in South bank of Walnut Creek with phosphate nodules in clayey soil above, top of limestone at approximately 890 feet; along South line of NE1/4, NE1/4, NE1/4, Sec. 36, T.28S., R.21E., Crawford Co., Kansas.

CR-275 = Limestone (Altamont?) exposed in road ditches on North side of road for about 0.1 mile just West of the SE cor. along the South line of Sec. 31, T.28S., R.22E., Crawford Co., Kansas.

CR-276 = Base of limestone (Altamont?) at 922 feet in road ditch on East side of road; approximately 550 feet South of Center of West line of Sec. 32, T.28S., R.22E., Crawford Co., Kansas.

CR-277 = Sandstone and sandy, silty mudrock on both sides of new bridge construction; approximately 300 feet North of Center of West line of Sec. 32, T.28S., R.22E., Crawford Co., Kansas.

CR-278 = Similar to CR-277; approximately 800 feet North of SE cor., Sec. 32, T.28S., R.22E., Crawford Co., Kansas.

CR-279 = Like CR-277 with silty, sandy mudrock exposed under the bridge; Center of South line of SW1/4, sec. 33, T.28S., R.22E., Crawford Co., Kansas.

CR-280 = Sandstone exposed in road on both sides; approximately 100 feet East of Center of South line of Sec. 32, T.28S., R.22E., Crawford Co., Kansas.

CR-281 = Limestone (Altamont?) above 942 feet in road with sandstone below; two points, one 500 feet West and the other 900 West of Center of South line of Sec. 32, T.28S., R.22E., Crawford Co., Kansas.

CR-282 = Limestone (Altamont?) above 942 feet in road with sandstone below; approximately 800 feet West of Center of South line of Sec. 7, T.29S., R.22E., Crawford Co., Kansas.

CR-283 = Silty, sandy mudrock in stream East of road; approximately 700 feet North of SW cor., Sec. 6, T.29S., R.22E., Crawford Co., Kansas.

CR-284 = Limestone, probably float, in pond bank on South side of road and in road to the East; near Center of North line of NE1/4, NW14, Sec. 1, T.29S., R.21E., Crawford Co., Kansas.

CR-285 = Approximately 5 feet of limestone (Altamont?) in road ditch on South side of road, base is inferred at 920 feet, lithologically like other limestones in this area; approximately 450 feet East of SW cor., Sec. 1, T.29S., R.21E., Crawford Co., Kansas.

CR-286 = Thin to platy, cross bedded sandstone in road ditch on West side of road, inferred contact with overlying limestone (Altamont?) at 910 feet based on change in road grade; creek exposure extends from the Center of the East line of Sec. 2 for about 0.3 miles South toward the SE cor., sec. 2, T.29S., R.21E., Crawford Co., Kansas.

CR-287 = Contact between limestone (Altamont?) above and sandstone below at 941 feet in road; Center of South line of Sec. 2, T.29S., R.21E., Crawford Co., Kansas.

CR-288 = Contact between limestone (Altamont?) above and possible sandstone below at 941 feet in road, area of Section C-35; approximately 200 feet East of SW Co., Sec. 2, T.29S., R.21E., Crawford Co., Kansas.

CR-289 = Like CR-288 but contact is at 903 to 905 feet; NW cor., Sec. 2, T.29S., R.21E., Crawford Co., Kansas.

CR-290 = Limestone (Altamont?) in road at 905 feet with sandstone below; approximately 1000 feet South of NW cor., Sec. 14, T.29S., R.21E., Crawford Co., Kansas.

CR-291 = Sandstone in road; approximately 100 feet South of Center of West line of Sec. 17, T. 29S., R.22E., Crawford Co., Kansas.

CR-292 = Thin bedded, platy sandy to silty mudrock in drainage; approximately 500 feet North of Center of South line of Sec. 17, T.29S., R.22E., Crawford Co., Kan

CR-293 = Thick sandstone in drainage at low water bridge; near Center of South line of SW1/4, SW1/4, SE1/4, Sec. 21, T.29S., R.22E., Crawford Co., Kansas.

CR-294 = Sandstone in road; Center of South line SW1/4, SE1/4, Sec. 20 T. 29S., R.22E., Crawford Co., Kansas.

CR-295 = Base of limestone (Altamont?) in road near top of hill 1.15 miles South of U.S. Highway 57 on road between Sections 26 and 27, T. 29S., R.21E., Crawford Co., Kansas, with sandstone in creek West of road; Grindstone Creek Quad.