New Mexico Geological Society

*Downloaded from:* https://nmgs.nmt.edu/publications/guidebooks/41




# *Type and reference sections of the Romeroville Sandstone (Dakota Group), Cretaceous of northeastern New Mexico*

Spencer G. Lucas

1990, pp. 323-326. https://doi.org/10.56577/FFC-41.323

*in:*

*Tectonic Development of the Southern Sangre de Cristo Mountains, New Mexico*, Bauer, P. W.; Lucas, S. G.; Mawer, C. K.; McIntosh, W. C.; [eds.], New Mexico Geological Society 41st Annual Fall Field Conference Guidebook, 450 p. https://doi.org/10.56577/FFC-41

*This is one of many related papers that were included in the 1990 NMGS Fall Field Conference Guidebook.*

## Annual NMGS Fall Field Conference Guidebooks

Every fall since 1950, the New Mexico Geological Society (NMGS) has held an annual Fall Field Conference that explores some region of New Mexico (or surrounding states). Always well attended, these conferences provide a guidebook to participants. Besides detailed road logs, the guidebooks contain many well written, edited, and peer-reviewed geoscience papers. These books have set the national standard for geologic guidebooks and are an essential geologic reference for anyone working in or around New Mexico.

### Free Downloads

NMGS has decided to make peer-reviewed papers from our Fall Field Conference guidebooks available for free download. This is in keeping with our mission of promoting interest, research, and cooperation regarding geology in New Mexico. However, guidebook sales represent a significant proportion of our operating budget. Therefore, only *research papers* are available for download. *Road logs*, *mini-papers*, and other selected content are available only in print for recent guidebooks.

### Copyright Information

Publications of the New Mexico Geological Society, printed and electronic, are protected by the copyright laws of the United States. No material from the NMGS website, or printed and electronic publications, may be reprinted or redistributed without NMGS permission. Contact us for permission to reprint portions of any of our publications.

One printed copy of any materials from the NMGS website or our print and electronic publications may be made for individual use without our permission. Teachers and students may make unlimited copies for educational use. Any other use of these materials requires explicit permission.

*This page is intentionally left blank to maintain order of facing pages.*

# TYPE AND REFERENCE SECTIONS OF THE ROMEROVILLE SANDSTONE (DAKOTA GROUP), CRETACEOUS OF NORTHEASTERN NEW MEXICO

SPENCER G. LUCAS
New Mexico Museum of Natural History, P.O. Box 7010, Albuquerque, New Mexico 87194

**Abstract**—I designate and describe a type section as well as surface and subsurface reference sections for the Cretaceous (Albian-?Cenomanian) Romeroville Sandstone (Dakota Group). At these sections, the Romeroville Sandstone is 3–4 m thick and dominated by bioturbated and trough-crossbedded quartzarenite. The Dakota Group in the Sangre de Cristo Mountains of New Mexico consists of three formations (in ascending order): Mesa Rica, Pajarito and Romeroville. The Romeroville Sandstone represents ravinement and onset of a transgressive systems tract during a relatively rapid sea-level rise.

## INTRODUCTION

Kues and Lucas (1987, p. 176) coined the name Romeroville Sandstone for the upper, sandstone-dominated interval of the Dakota Group (Albian-?Cenomanian) in northeastern New Mexico. Although Kues and Lucas (1987, p. 176) noted that the type section of the Romeroville Sandstone was "on the northern highway cut at Romeroville Gap," this type section was not described. Here, I describe this section and designate and describe surface and subsurface reference sections for the Romeroville Sandstone. I also discuss briefly Dakota Group stratigraphy in the southern Sangre de Cristo Mountains as well as the origin of the Romeroville Sandstone.

## TYPE AND SURFACE REFERENCE SECTIONS

The type section of the Romeroville Sandstone (Fig. 1) is very accessible in the east-facing highway cut of I-25 at Romeroville Gap (Fig. 2A) and well represents the lithology and thickness of the Romeroville Sandstone. At its type section the Romeroville Sandstone is 3.5 m thick and disconformably overlies the Pajarito Formation (Fig. 2A–B). Quartzarenite dominates the Romeroville Sandstone, and typical bedforms are planar and trough crossbeds. However, many sandstones are bioturbated or massive, and distinct scour surfaces mark the bases of all sand bodies. *Ophiomorpha* are present about 2.5 m above the base of the Romeroville (Fig. 1, 2C). Associated conglomerates are lag deposits of clay and siltstone pebbles in a quartzarenite matrix. Bentonitic shale of the lower member of the Graneros Shale rests on the Romeroville Sandstone at its type section.

The 3.2 m of Romeroville Sandstone exposed at its reference section (Fig. 1, 2d) at Montezuma Gap are very similar to strata at the type section. The Romeroville here rests disconformably on silty shale and sandy siltstone of the Pajarito Formation and is overlain by bentonitic shale of the lower member of the Graneros Shale. The only significant lithologic difference between the Romeroville at its type and reference

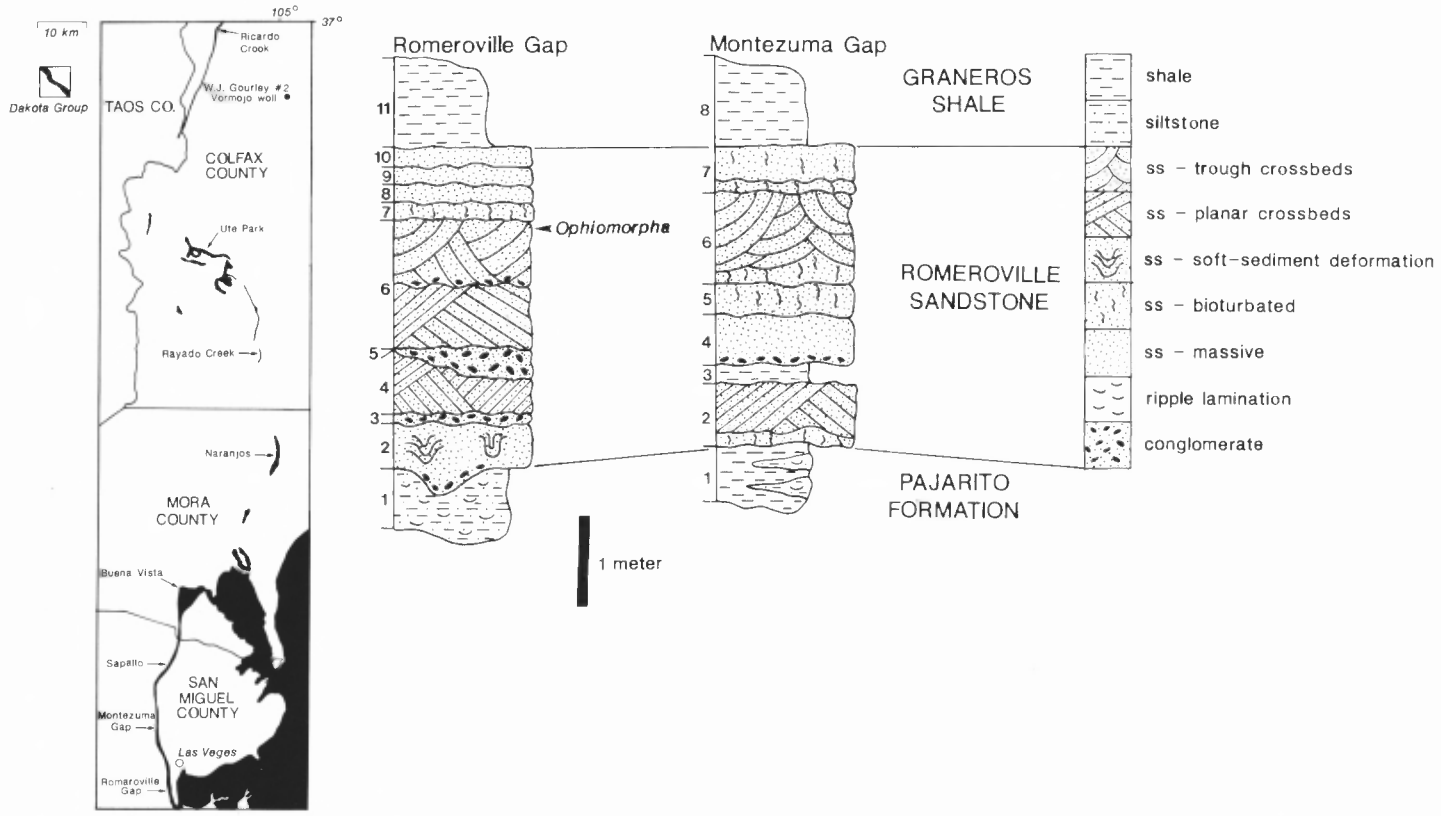



FIGURE 1. Distribution of the Dakota Group in northeastern New Mexico and the surface type and reference sections of the Romeroville Sandstone. See Appendix for descriptions of lithologic units in measured sections.

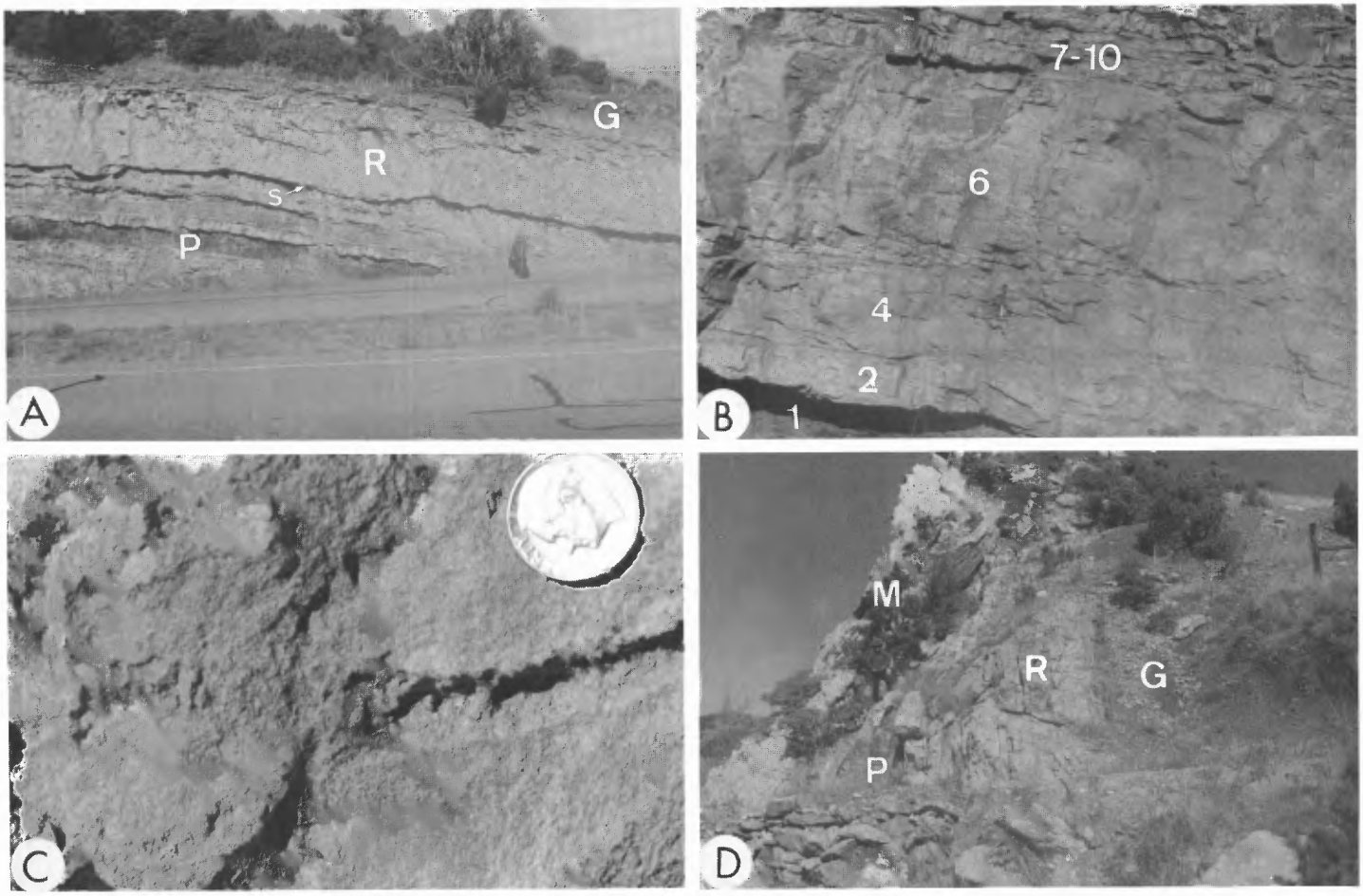



FIGURE 2. Photographs of type and reference sections of the Romeroville Sandstone. A, Type section of Romeroville Sandstone. Note basal scour surface (s) of the Romeroville on the Pajarito Formation. B, Close-up of type section of Romeroville Sandstone (unit 2 is 0.5 m thick). Numbered units are those of the measured section in Figure 1. C, *Ophiomorpha* burrow in top of unit 6 at type section of Romeroville Sandstone. D, Surface reference section of Romeroville Sandstone at Montezuma Gap. Abbreviations are: G = Graneros Shale, M = Mesa Rica Sandstone, P = Pajarito Formation, R = Romeroville Sandstone.

sections is the presence of a thin (0.2 m) bed of carbonaceous shale in the reference section (unit 3: Fig. 1). At both sections, some Romeroville sand bodies contain significant amounts of carbonaceous debris as pellets and in flaser-bedded intervals (Appendix).

The reference section of the Romeroville Sandstone is easily accessed via the all-weather road from Montezuma to Los Vigiles. It is the only location where age diagnostic fossils—probable Early Cretaceous (Albian) pollen (Baltz and O'Neill, 1986)—have been reported from the Romeroville Sandstone.

## SUBSURFACE REFERENCE SECTION

I designate a subsurface reference section for the Romeroville Sandstone in the W. J. Gourley #2 Vermejo well (Fig. 3). This well is located in sec. 16, T30N, R19E, Colfax County (864 ft north of south line, 820 ft east of west line). It is about 150 km north of the type section of the Romeroville Sandstone (Fig. 1). The ground-level elevation of the well is 7200 ft, and it was drilled to a depth of 5426 ft. I choose this well because it has clear SP, resistivity and gamma-ray logs (Fig. 3) that show responses similar to those characteristic of the Romeroville in other well logs from northeastern New Mexico I have examined. The SP and resistivity logs of a portion of this well have been published previously (Gilbert and Asquith, 1976, fig. 7; Asquith and Gilbert, 1976, fig. 1).

I identify the Romeroville Sandstone in this well at a depth of 5146–5158 ft, so it is 12 ft (3.6 m) thick. The SP log shows a significant negative deflection from the shale baseline at this depth (Fig. 3). Indeed, the SP at a depth of 5154 ft (uncorrected for bed thickness) is −70 mv. This SP deflection is characteristic of a thin, shale-free sandstone where the resistivity of the mud filtrate is much greater than that of the formation water.

The induction-resistivity log (Fig. 3) shows a significant increase in resistivity at the depth of the Romeroville Sandstone with a resistivity peak at a depth of 5149 ft of 59 ohm-meters for the 16″-normal. This resistivity is consistent with identification of the Romeroville in the well as a clean sand. The shallow resistivity curve and deep resistivity curve for the Romeroville Sandstone are little separated (Fig. 3). This lack of invasion indicates an impermeable ("tight") sandstone, similar to Romeroville sandstones on outcrop.

The gamma-ray log (Fig. 3) shows a significant decrease in gamma-ray response at the depth of the Romeroville Sandstone, typical of a shale-free sandstone. Indeed, the minimum gamma-ray reading for the Romeroville Sandstone, 7.5 API units at a depth of 5154 ft, is the minimum gamma-ray reading for the entire log. This indicates a clean sand (0% shaliness). All three logs thus identify the Romeroville in subcrop as an essentially homogenous, clean sand much like the Romeroville at its surface type and reference sections.

## DAKOTA GROUP STRATIGRAPHY, SANGRE DE CRISTO MOUNTAINS

Most geologists who have examined the Dakota Group along the Sangre de Cristo front range in New Mexico have recognized its tripartite nature. Indeed, an informal terminology arose to refer to the three units of the Dakota (Bejnar and Lessard, 1976; Gilbert and Asquith, 1976; Mateer, 1987). However, Kues and Lucas (1987) and Lucas and Kisucky (1988) advocated replacing the informal terminology with formal names, two of which—Mesa Rica Sandstone and Pajarito For-

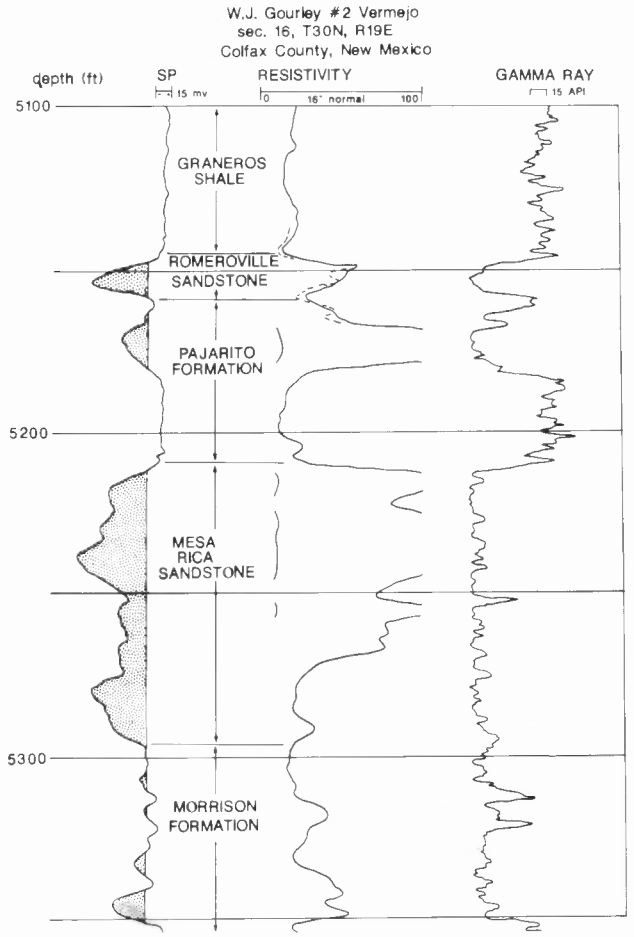



FIGURE 3. SP, resistivity and gamma-ray logs of the subsurface reference section of the Romeroville Sandstone in the W. J. Gourley #2 Vermejo well, Colfax County. Dashed lines in the resistivity log are long normal traces.

mation—were coined in the Tucumcari basin by Dobrovolny and Summerson (in Dobrovolny et al., 1946).

Most of the thickness of the Dakota Group in the Sangre de Cristo Mountains is represented by the basal, Mesa Rica Sandstone ("lower sandstone unit," "lower braided alluvial interval" or "lower sandstone member" of earlier workers). The Mesa Rica forms prominent hogbacks all the way up the front range, especially at Romeroville (e.g., Lucas et al., 1985), Montezuma (e.g., Northrop et al., 1946), Sapello (Baltz and O'Neill, 1986), Buena Vista (Johnson, 1975), Naranjos (Bachman, 1953), Rayado (Robinson et al., 1964), Ute Park (Clark and Read, 1972) and Ricardo Creek (Pillmore, 1976) (Fig. 1). Reported thicknesses range as high as 50–55 m. It is fair to say that most geologists' conception of the Dakota Group in the Sangre de Cristo Mountains has long been based primarily on the Mesa Rica Sandstone. Indeed, Hayden (1869, p. 63), when he examined the section at Montezuma, identified the Mesa Rica as "the sandstone 'hog-back,' regarded as lower cretaceous [sic] No. 1. A very conspicuous formation in this region."

The carbonaceous shales, siltstones and bioturbated sandstones of the Pajarito Formation ("middle shale unit," "middle shale member" or "meander-belt interval" of earlier workers) overlie the Mesa Rica Sandstone in the front range at least as far north as Urraca Creek on the Philmont Scout Ranch (Simms, 1965). Typical reported thicknesses range from 3 to 12 m.

Baltz et al. (1956, p. 22) identified the Mesa Rica Sandstone and Pajarito Formation at Romeroville Gap as "Purgatoire Formation." Recent U.S. Geological Survey maps (e.g., Johnson, 1975; Baltz and O'Neill, 1984, 1986) state that the "medial and lower parts [of the Dakota, i.e., the Mesa Rica and Pajarito] may be equivalent to the Lower Cretaceous Purgatoire Formation." However, the Mesa Rica and Pajarito, although of late Albian age (Kues et al., 1985; Kues and Lucas, 1987; Lucas and Kisucky, 1988; Lucas et al., 1989), are younger than and overlie the "Purgatoire Group" (Lytle and Glencairn Formations) to the east. As Kues and Lucas (1987) noted, there are no known outcrops of the "Purgatoire" along the Sangre de Cristo front range in New Mexico. The Mesa Rica Sandstone rests disconformably on the Jurassic-Cretaceous Morrison Formation.

Earlier workers referred to the Romeroville Sandstone as the "upper sandstone unit," "upper sandstone member" or "marine-sand interval" of the Dakota. The Romeroville is not always present at Dakota Group outcrops I have examined, and it is never more than 9 m thick. It represents ravinement and onset of a new transgressive systems tract in northeastern New Mexico (base of the Greenhorn cyclothem of traditional terminology). The disconformity between the Romeroville and underlying Pajarito Formation is the basal transgressive surface. The thin and sporadic occurrence of the Romeroville Sandstone in northeastern New Mexico suggests that relative sea level was rising rapidly in this region during the latest Albian. During such a rapid rise, depocenters were abruptly and rapidly shifted landward, and thus little or no transgressive deposition took place outside of incised valleys (Posamentier and Vail, 1988).

## ACKNOWLEDGMENTS

I thank Steven Hayden for help in the field; Michael Kisucky, Barry Kues, Niall Mateer and Robyn Wright-Dunbar for thought-provoking discussions; and Orin Anderson, John Lorenz and Niall Mateer for reviewing the manuscript. This article is a contribution to IGCP-245, "Nonmarine Cretaceous correlations."

## REFERENCES

Asquith, G. B. and Gilbert, J. L., 1976, Proximal and distal braided alluvial facies in the lower braided alluvial interval of the Dakota Sandstone northeastern New Mexico: New Mexico Geological Society, Guidebook 27, pp. 153–155.

Bachman, G. O., 1953, Geology of a part of northwestern Mora County, New Mexico: U.S. Geological Survey, Oil and Gas Investigations, Map OM-137.

Baltz, E. H. and O'Neill, J. M., 1984, Geologic map and sections of the Mora River area, Sangre de Cristo Mountains, Mora County, New Mexico: U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1456, scale 1:24,000.

Baltz, E. H. and O'Neill, J. M., 1986, Geologic map and cross sections of the Sapello River area, Sangre de Cristo Mountains, Mora and San Miguel Counties, New Mexico: U.S. Geological Survey, Miscellaneous Investigations Series, Map I-1575, scale 1:24,000.

Baltz, E. H., Wanek, A. A. and Read, C. B., 1956, First day Santa Fe to Pecos, to Cowles; Pecos to Las Vegas: New Mexico Geological Society, Guidebook 7, pp. 15–48.

Bejnar, C. R. and Lessard, R. H., 1976, Paleocurrents and depositional environments of the Dakota Group San Miguel and Mora Counties, New Mexico: New Mexico Geological Society, Guidebook 27, pp. 157–163.

Clark, K. F. and Read, C. B., 1972, Geology and ore deposits of Eagle Nest area, New Mexico: New Mexico Bureau of Mines and Mineral Resources, Bulletin 94, 152 pp.

Dobrovolny, E., Summerson, C. H. and Bates, R. L., 1946, Geology of northwestern Quay County, New Mexico: U.S. Geological Survey, Oil and Gas Investigations Preliminary Map 62, scale 1:62,500.

Gilbert, J. L. and Asquith, G. B., 1976, Sedimentology of braided alluvial interval of Dakota Sandstone, northeastern New Mexico: New Mexico Bureau of Mines and Mineral Resources, Circular 176, 16 pp.

Goddard, E. N., Trask, P. D., DeFord, R. K., Rove, O. N., Singewald, J. T. and Overbeck, R. M., 1984, Rock-color chart: Boulder, Geological Society of America.

Hayden, F. V., 1869, Preliminary field report of the United States Geological Survey of Colorado and New Mexico: U.S. Geological Survey, Third Annual Report, 156 pp.

Johnson, R. B., 1975, Geologic map of the Rainsville quadrangle, Mora County, New Mexico: U.S. Geological Survey, Geological Quadrangle Map, GQ-1276, scale 1:24,000.

Kues, B. S. and Lucas, S. G., 1987, Cretaceous stratigraphy and paleontology in the Dry Cimarron Valley, New Mexico, Colorado and Oklahoma: New Mexico Geological Society, Guidebook 38, pp. 167–198.

Kues, B. S., Lucas, S. G., Kietzke, K. K. and Mateer, N. J., 1985, Synopsis of Tucumcari Shale, Mesa Rica Sandstone and Pajarito Shale paleontology,

Cretaceous of east-central New Mexico: New Mexico Geological Society, Guidebook 36, pp. 261–281.
Lucas, S. G. and Kisucky, M. J., 1988, Type and reference sections of the Tucumcari, Mesa Rica and Pajarito Formations, Cretaceous of east-central New Mexico: New Mexico Geology, v. 10, pp. 82–89.
Lucas, S. G., Hunt, A. P. and Kietzke, K. K., 1989, Stratigraphy and age of Cretaceous dinosaur footprints in northeastern New Mexico and northwestern Oklahoma; *in* Gillette, D. D. and Lockley, M. G., eds., Dinosaur tracks and traces: Cambridge, Cambridge University Press, pp. 217–221.
Lucas, S. G., Kues, B. S., Weadock, G., Kietzke, K. K., Hawley, J. W., Hunt, A. P. and Mateer, N. J., 1985, Second-day road log from Santa Rosa to Newkirk, Variadero, Trujillo, Las Vegas, Tecolotito, Anton Chico, Dilia and back to Santa Rosa: New Mexico Geological Society, Guidebook 36, pp. 33–61.
Mateer, N. J., 1987, The Dakota Group of northeastern New Mexico and southern Colorado: New Mexico Geological Society, Guidebook 38, pp. 223–236.
Northrop, S. A., Sullwold, H. H., Jr., MacAlpin, A. J. and Rogers, C. P., Jr., 1946, Geologic maps of the Las Vegas basin and of the foothills of the Sangre de Cristo Mountains, San Miguel and Mora Counties, New Mexico: U.S. Geological Survey, Oil and Gas Investigations, Preliminary Map 54.
Pillmore, C. L., 1976, Supplementary road log to Ricardo Creek section, an exposure of lower Mesozoic rocks near the New Mexico–Colorado state line: New Mexico Geological Society, Guidebook 27, pp. 45–47.
Posamentier, H. W. and Vail, P. R., 1988, Eustatic controls on clastic deposition II—sequence and systems tract models: Society of Economic Paleontologists and Mineralogists, Special Publication 42, pp. 125–154.
Robinson, G. D., Wanek, A. A., Hays, W. H. and McCallum, M. E., 1965, Philmont country. The rocks and landscape of a famous New Mexico ranch: U.S. Geological Survey, Professional Paper 505, 152 pp.
Simms, R. W., 1965, Geology of the Rayado area, Colfax County, New Mexico [M.S. thesis]: Albuquerque, University of New Mexico, 90 pp.

## APPENDIX—DESCRIPTION OF MEASURED SECTIONS

The type and surface-reference sections of the Romeroville Sandstone are described below. Rock colors are those of Goddard et al. (1984).

### Romeroville Gap

Section measured in the east-facing cut of I-25 at Romeroville Gap, UTM 3931200N, 478550E, zone 13. Strata dip 16° to N60°E.

| unit | lithology | thickness (m) |
|---|---|---|
| | Graneros Shale | |
| | lower member: | |
| 11 | Shale and sandy shale; yellowish gray (5 Y 8/1) very pale orange (10 YR 8/2); bentonitic; not calcareous. | 0.9+ |
| | Romeroville Sandstone (type section): | |
| 10 | Sandstone; very pale orange (10 YR 8/2); weathers dark yellowish orange (10 YR 6/6) and light brown (5 YR 5/6); quartzarenite; very fine-medium grained; subrounded; moderately sorted; not calcareous; base of unit is prominent scour surface. | 0.2 |
| 9 | Sandstone; same colors as unit 10; quartzarenite; very fine-fine grained; subrounded; well sorted; not calcareous; top of unit has flaser beds of grayish black (N2) carbonaceous shale; base of unit is prominent scour surface. | 0.2 |
| 8 | Sandstone; same colors and lithology as unit 9 but with many pellets and flasers of grayish black (N2) carbonaceous shale. | 0.2 |
| 7 | Sandstone; same colors and lithology as unit 8 but with more grayish black (N2) carbonaceous debris and with grayish brown (5 YR 3/2) to light brown (5 YR 5/6), oxidized plant stems; intensively bioturbated with a hint of ripple lamination. | 0.2 |
| 6 | Sandstone; grayish orange (10 YR 7/4); dark yellowish orange (10 YR 6/6) and pale yellowish brown (10 YR 6/2); quartzarenite; very fine-medium grained; subangular-subrounded; poorly sorted; minor feldspars; not calcareous; lower 70 cm has planar crossbeds in 2–4-cm-thick beds; 70 cm above base is surface of very light gray (N8) clay balls up to 0.8 cm in diameter and clay flasers; upper 70 cm has small-scale trough crossbeds in 8-cm-thick sets; top 20 cm of unit has *Ophiomorpha*. | 1.4 |
| 5 | Conglomeratic sandstone; very light gray (N8) to light gray (N7); weathers grayish orange (10 YR 7/4) and dark yellowish orange (10 YR 6/6); quartzarenite; medium-coarse grained; subangular-subrounded; well sorted; not calcareous; hematitic; pebbles are very light gray (N8) clay balls up to 0.8 cm in diameter; unit is a lense that thins to 0.1 m thick over a strike distance of 6.0 m. | 0.3 |
| 4 | Sandstone; very pale orange (10 YR 8/2), grayish orange (10 YR 7/4) and pale yellowish orange (10 YR 8/6); some weathered surfaces are moderate red (5 R 4/6); quartzarenite; fine-medium grained; subrounded; well sorted; not calcareous; planar crossbeds with bed thicknesses from 4–10 cm. | 0.4 |
| 3 | Conglomerate; grayish orange (10 YR 7/4) and moderate yellowish brown (10 YR 5/4); matrix is very fine-coarse-grained, subangular-subrounded, poorly sorted quartz sand; clasts are moderate red (5 R 4/6) clay balls up to 1.0 cm in diameter; matrix supported; unit sits in scour surface into unit 2. | 0.1 |
| 2 | Sandstone; very pale orange (10 YR 8/2); weathers yellowish gray (5 Y 8/1); quartzarenite; very fine grained; subrounded; well sorted; not calcareous; minor feldspars; fills scours 0.3 m deep into unit 1 and has some siltstone rip-ups; some soft-sediment deformation. | 0.5 |
| | Disconformity | |
| | Pajarito Formation: | |
| 1 | Sandy siltstone; light gray (N7) with dark yellowish orange (10 YR 6/6) hematitic oxidation spots; not calcareous; ripple laminar. | not measured |

### Montezuma Gap

Measured in the south-facing cut of the all-weather road between Montezuma and Los Vigiles, UTM 3945150N, 475400E, zone 13. Strata dip 90° to N80°E.

| unit | lithology | thickness (m) |
|---|---|---|
| | Graneros Shale | |
| | lower member: | |
| 8 | Silty shale; dark gray (N3) to medium gray (N5) with pale yellowish orange (10 YR 8/6) bentonite beds and some bioturbated beds of dark gray (N3) micrite. | not measured |
| | Romeroville Sandstone (reference section): | |
| 7 | Sandstone; very light gray (N8) and grayish black (5 YR 2/1); weathers grayish orange (10 YR 7/4) and dark yellowish orange (10 YR 6/6); quartzarenite; very fine-fine grained; subrounded; moderately sorted; much carbonaceous debris; not calcareous; bioturbated; prominent scour surfaces at base of unit and 0.1 m above base. | 0.5 |
| 6 | Sandstone; light gray (N7) and medium light gray (N6); weathers very pale orange (10 YR 8/2) and grayish orange (10 YR 7/4); quartzarenite; very fine-fine grained; subrounded; well sorted; some carbonaceous debris as in unit 7; not calcareous; lower 0.1 m bioturbated; upper 0.9 m has low angle trough crossbeds. | 1.0 |
| 5 | Sandstone with thin (3–5 cm) bed of carbonaceous shale 13 cm above base; very pale orange (10 YR 8/2), grayish orange (10 YR 7/4) and pale yellowish brown (10 YR 6/2); quartzarenite; very fine-fine grained; subrounded; moderately sorted; has oxidized plant-stem fragments; bioturbated. | 0.3 |
| 4 | Sandstone; light olive gray (5 Y 6/1); weathers to same colors as unit 5; quartzarenite; very fine-coarse grained (bimodal); subrounded; poorly sorted; not calcareous; minor feldspars; lower 0.1 m has very coarse-grained to pebbly, subangular clasts of siltstone and chert that are bluish white (5 B 9/1). | 0.5 |
| 3 | Shale; medium dark gray (N4) and dark gray (N3); carbonaceous; not calcareous. | 0.2 |
| 2 | Sandstone; same colors as unit 5; quartzarenite; very fine-fine grained; subangular; poorly sorted; not calcareous; bioturbated base overlain by planar crossbeds; base is a scour surface with 0.3 m of relief. | 0.7 |
| | Disconformity | |
| | Pajarito Formation: | |
| 1 | Silty shale and sandy siltstone; shale is medium dark gray (N4) and dark gray (N3) and not calcareous; siltstone is light gray (N7) and medium light gray (N6), not calcareous and ripple laminar. | 3.0+ |