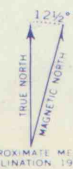


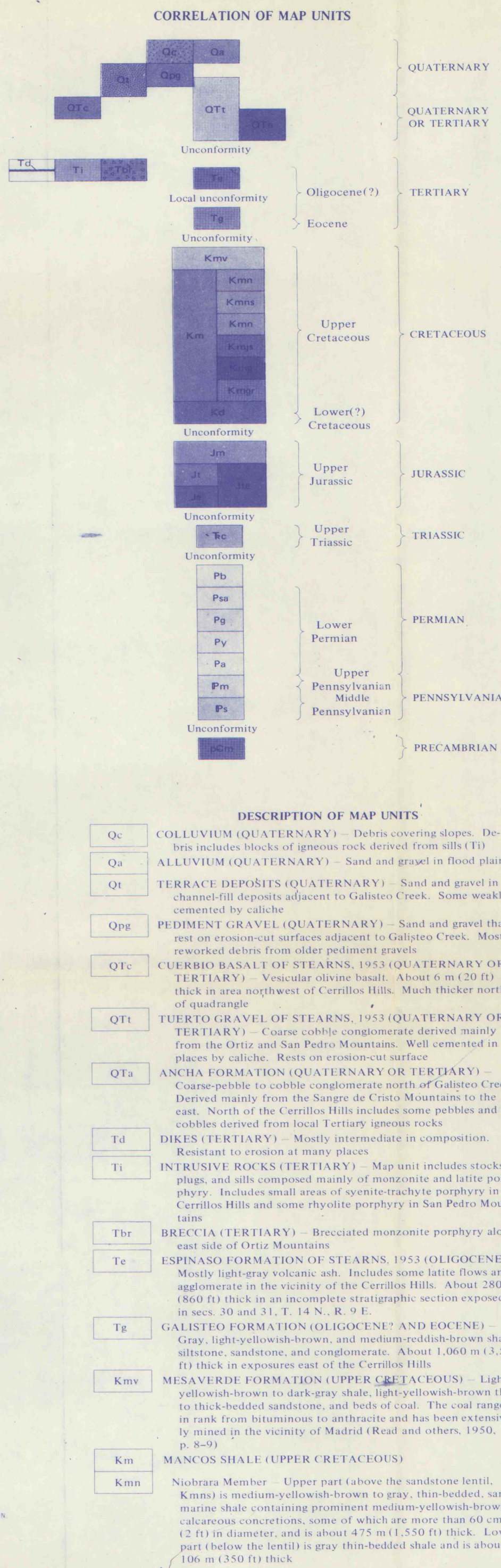
Base from U.S. Geological Survey, 1961
10,000-foot grid based on New Mexico
coordinate system, central zone
1000-metre Universal Transverse Mercator
grid ticks, zone 13, shown in blue



SCALE 1:62 500
0 1 2 3 4 MILES
0 1 2 3 4 KILOMETRES
CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL



Geology mapped in 1966-72



QUATERNARY
Qc COLLUVIUM (QUATERNARY) - Debris covering slopes. Debris includes blocks of igneous rock derived from sills (Ti)
Qa ALLUVIUM (QUATERNARY) - Sand and gravel in flood plains
Qd TERRACE DEPOSITS (QUATERNARY) - Sand and gravel in channel-fill deposits adjacent to Galisteo Creek. Some weakly cemented by caliche
Qpg PEDIMENT GRAVEL (QUATERNARY) - Sand and gravel that rest on erosion-cut surfaces adjacent to Galisteo Creek. Mostly reworked debris from older pediment gravels
Qtc CUERBIO BASALT OF STEARNS, 1953 (QUATERNARY OR TERTIARY) - Vesicular olivine basalt. About 6 m (20 ft) thick in area northwest of Cerrillos Hills. Much thicker north of quadrangle
Qti TUERTO GRAVEL OF STEARNS, 1953 (QUATERNARY OR TERTIARY) - Coarse cobble conglomerate derived mainly from the Ortiz and San Pedro Mountains. Well cemented in places by caliche. Rests on erosion-cut surface
Qta ANCHA FORMATION (QUATERNARY OR TERTIARY) - Coarse- to medium-grained conglomerate north of Galisteo Creek. Derived mainly from the Sangre de Cristo Mountains to the east. North of the Cerrillos Hills includes some pebbles and cobbles derived from local Tertiary igneous rocks
Td DIKES (TERTIARY) - Mostly intermediate in composition. Resistant to erosion at many places
Ti INTRUSIVE ROCKS (TERTIARY) - Map unit includes stocks, plugs, and sills composed mainly of monzonite and latite porphyry. Includes small areas of syenite-trachyte porphyry in Cerrillos Hills and some rhyolite porphyry in San Pedro Mountains
Tbr BRECCIA (TERTIARY) - Brecciated monzonite porphyry along east side of Ortiz Mountains
Te ESPINASO FORMATION OF STEARNS, 1953 (OLIGOCENE?) - Mostly light-gray volcanic ash. Includes some latite flows and agglomerate in the vicinity of the Cerrillos Hills. About 280 m (860 ft) thick in an incomplete stratigraphic section exposed in secs. 30 and 31, T. 14 N., R. 9 E.
Tg GALISTEO FORMATION (OLIGOCENE? AND EOCENE) - Gray, light-yellowish-brown, and medium-reddish-brown shale, siltstone, sandstone, and conglomerate. About 1,060 m (3,500 ft) thick in exposures east of the Cerrillos Hills
Kmv MESAVERDE FORMATION (UPPER CRETACEOUS) - Light-yellowish-brown to dark-gray shale, light-yellowish-brown thin- to thick-bedded sandstone, and beds of coal. The coal ranges in rank from bituminous to anthracite and has been extensively mined in the vicinity of Madrid (Read and others, 1950, p. 8-9)
Km MANCOS SHALE (UPPER CRETACEOUS)
Kmn Niobrara Member - Upper part (above the sandstone lentil, Kmns) is medium-yellowish-brown to gray, thin-bedded, sandy, marine shale containing prominent medium-yellowish-brown calcareous concretions, some of which are more than 60 cm (2 ft) in diameter, and is about 475 m (1,550 ft) thick. Lower part (below the lentil) is gray thin-bedded shale and is about 106 m (350 ft) thick
Kmns Sandstone lentil - Fine-grained, even-bedded, light-yellowish-gray sandstone; ranges in thickness from 63 m (205 ft) north of Galisteo Creek to 104 m (340 ft) south of Galisteo Creek. It may be equivalent to the El Vado Sandstone Member of the Mancos Shale in the San Juan Basin, northwestern New Mexico (Landis and Dane, 1967)
Kmjs Juana Lopez Member and shale - The Juana Lopez is a fetid, bioclastic limestone 1-2 m (3-6 ft) thick. The underlying shale, equivalent to the Carlile Shale, is a poorly exposed medium-gray thin-bedded shale about 90-120 m (300-400 ft) thick
Kmg Greenhorn Limestone Member - Thin-bedded medium-gray argillaceous limestone containing interbeds of calcareous shale, 6-8.5 m (20-30 ft) thick
Kmgr Graneros Shale Member - Thin-bedded, medium-gray marine shale, 55 m (180 ft) thick
Kd DAKOTA SANDSTONE (UPPER AND LOWER? CRETACEOUS) - Medium-yellowish-gray, thick-bedded coarse-grained to conglomeratic sandstone containing interbeds of carbonaceous gray shale. Forms prominent ledges. 28-45 m (90-150 ft) thick
Jm MORRISON FORMATION (UPPER JURASSIC) - Dark-reddish-brown to gray and greenish-gray claystone and shale, interbedded with medium- to yellowish-gray fine- to coarse-grained sandstone. Sandstone beds form prominent ledges. About 230 m (675 ft) thick in northwestern part of quadrangle
Jt TODILTO LIMESTONE (UPPER JURASSIC) - Medium- to dark-gray, thin-bedded, fetid limestone. About 3 m (10 ft) thick. In northwestern part of quadrangle includes white massive gypsum as much as 34 m (110 ft) thick
Jc ENTRADA SANDSTONE (UPPER JURASSIC) - Fine- to medium-grained, cross-laminated, light-gray to light-yellowish-gray sandstone. Forms prominent ledges. It is 22 m (66 ft) thick in northwestern part of the quadrangle
Jte TODILTO LIMESTONE AND ENTRADA SANDSTONE UNDIVIDED (UPPER JURASSIC)
Jc CHINLE FORMATION (UPPER TRIASSIC) - Medium- to dark-reddish-brown shale, siltstone, and interbeds of sandstone. Some beds of sandstone are mottled gray, micaceous, and conglomeratic. Light-reddish-brown near top of formation. Includes conglomeratic sandstone beds about 15 m (50 ft) thick at base which may be equivalent to the Santa Rosa Sandstone in eastern New Mexico. Exposures are incomplete in this quadrangle, but thickness is estimated to be at least 150 m (500 ft)
Pb BERNAL FORMATION (PERMIAN) - Yellowish-gray siltstone and brownish-yellow to gray shale, 33.5 m (110 ft) thick in northeastern part of San Pedro Mountains
Psa SAN ANDRES LIMESTONE (LOWER PERMIAN) - Medium- to light-gray, fine-grained, dense, fetid limestone. Beds are 15-30 cm (6 in.-1 ft) thick. Formation is 16 m (52 ft) thick in northeastern part of San Pedro Mountains
Pg GLORIETA SANDSTONE (LOWER PERMIAN) - Medium- to light-gray, fine- to medium-grained, well-sorted sandstone; grains are well rounded. 32 m (105 ft) thick in northeastern part of San Pedro Mountains
Py YESO FORMATION (LOWER PERMIAN) - Medium-reddish-brown and gray shale, siltstone, and some fine- to medium-grained sandstone. Exposures are poor and beds contorted, but the estimated thickness is about 150 m (500 ft) in the San Pedro Mountains
Pa ABO FORMATION (LOWER PERMIAN) - Medium-brown to dark-reddish-brown shale, sandstone, and conglomeratic sandstone
Pm MADERA FORMATION (UPPER AND MIDDLE PENNSYLVANIAN) - Gray limestone, gray to reddish-brown shale, sandstone, and arkose in upper part and thick-bedded cherty limestone in lower part. Thickness not measured because of faulting and intrusions, but probably does not exceed 300 m (1,000 ft)
Ps SANDIA FORMATION (MIDDLE PENNSYLVANIAN) - Yellowish-brown to brown shale and shaly sandstone containing thin beds of yellow fossiliferous limestone; some conglomeratic sandstone. Rests unconformably on Precambrian rocks. About 30 m (100 ft) thick
pCm METAMORPHIC ROCKS (PRECAMBRIAN) - Medium-brown quartz-mica schist, light- to medium-gray and medium-brown quartzite, dark-gray amphibole-mica schist, and stringers of pink granite. Exposed only near southwest corner of quadrangle

REFERENCES
Landis, E. R., and Dane, C. H., 1967, Geologic map of the Tierra Amarilla quadrangle, Rio Arriba County, New Mexico: New Mexico Bur. Mines and Mineral Resources, Geol. Map 19.
Read, C. B., Duffner, R. T., Wood, G. H., and Zapp, A. D., 1950, Coal resources of New Mexico: U.S. Geol. Survey Circ. 89, 24 p.
Stearns, C. E., 1953, Tertiary geology of the Galisteo-Tongue area, New Mexico: Geol. Soc. America Bull., v. 64, no. 4, p. 459-507.

GEOLOGIC MAP OF THE MADRID QUADRANGLE, SANTA FE AND SANDOVAL COUNTIES, NEW MEXICO

By
George O. Bachman
1975

J. PAUL STORRS
P.E. AND L.S.
CONSULTING MINE ENGINEERS
2025 Moore St. Phone
Denver (Lakewood) (303) 233-1880
Colorado 80215

IMAPS #13747

For sale by U.S. Geological Survey
Denver, Colo. 80225 and Reston, Va. 22092