Geologic Map of the Tierra Amarilla 7.5-Minute Quadrangle, Rio Arriba County, New Mexico

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Open-file Digital Geologic Map OF-GM 268

Scale 1:24,000

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Description of Map Units for Tierra Amarilla 7.5-Minute Quadrangle, Rio Arriba County, New Mexico

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Explanation of descriptive terms.

Colors (e.g., rocks, outcrops) are subjective; strength, sorting, angularity, grain/clast size, and hand-sample descriptive terms after Compton (1985); sedimentary terms after Boggs (1995). Queries (?) after descriptors indicate uncertainty.

Af

Artificial fill found in dams and thick roadbeds.

QUATERNARY ROCKS

Qal

Undivided Quaternary Alluvium (Holocene and/or Pleistocene)

Light- to dark-brown and/or dark-grey and/or orangish; loose to friable; fine- to coarse-grained; poorly sorted, medium- to thick-bedded, sometimes weakly calcite-cemented clayey, silty, pebbly sand, and sandy silt. Composed mostly of local Cretaceous rock debris sometimes with some quartzite cobbles like those seen in Qt. Qal here represents both active upland valley-bottom alluvium and floodplain, coarse channel sediment, and river terraces and small alluvial fans within 2 m of the river level. Quaternary alluvium is only mapped where it is clearly >2 m thick and/or it obscures large areas of bedrock units and/or unit contacts.

Qalh

Higher-level Quaternary Alluvium (Holocene and/or Pleistocene)

Light- to dark-brown and/or black or orangish; loose to friable; fine- to coarse-grained; poorly sorted, medium- to thick-bedded, sometimes weakly calcite-cemented clayey, silty, pebbly sand, and sandy silt. Often composed of debris from adjacent hillsides (e.g., chips of limestone from Kmgl, angular clasts derived from weathering of large concretions found in members of the Mancos shale, and platy debris from Kmjl) and sometimes containing pebbles and small cobbles of quartzite and volcanic rocks.

This unit represents Quaternary alluvium found in relatively high topographic positions. Some parts probably represent the toe of colluvial aprons that have been isolated by continued/renewed denudation and/or small alluvial fans at the mouths of small drainages. The unit is mapped where inferred to be >2 m thick and/or they obscure bedrock units. Although found at higher topographic levels not all parts of this unit are necessarily older than Qal as some deposits show signs of active deposition.

Qg

Undivided Quaternary Gravel

Loose to friable; poorly to moderately sorted, rounded- to subrounded-pebbly-sand and sandy-pebble-to-boulder conglomerate composed of quartzite, and Tertiary volcanic rocks ±sandstone, Brazos Basalt, and sometimes cherty ironstone pebbles. Much of this unit may be reworked Quaternary terrace gravels. These possibly reworked deposits drape across topography more than Qt deposits and do not have the fine (overbank(?)) deposits sometimes found in Qt deposits. Chocolate-brown to reddish, cherty ironstone pebbles (≈0.25–1.2 cm) found in some gravel deposits are derived from Kmf (Menefee Fm.) and are found in some Qt and Qg deposits downstream of Kmf outcrops. Between ≈1 and 10 m thick.

Qt

Quaternary Terrace Deposits (Holocene and Pleistocene)

Loose to friable; poorly to moderately sorted, rounded- to subrounded-pebbly-sand and sandy-pebble-to-boulder conglomerate sometimes capped by 1–3 m of reddish, brownish and orangish; loose to friable; massive(?) sand, silty sand, and sandy silt. Clasts usually consist of quartzite, Tertiary intermediate to silicic volcanics, and “Brazos Basalt,” Qb. Terraces of the main stem of the Rio Chama contain approximately 1–5% basalt cobbles presumably derived from the 0.25–1.10 Ma Brazos Basalts (Scott and Marvin, 1985). Chips of limestone from both Kmgr and Kmjl sometimes make up significant portions of the pebbles in Qt deposits particularly downstream from outcrops of these rocks. Chocolate-brown to reddish, cherty-ironstone pebbles (≈0.25–1.2 cm) found in some gravel deposits are derived from Kmf (Menefee Fm.) and are found in both Qt and Qg deposits downstream of Kmf outcrops. Some of the terraces—especially the larger and older ones—have been modified by erosion and may have several meters of relief on their upper surfaces. In many cases, this appears to be the result of the finer parts of the terrace deposit (floodplain deposits) having been stripped off of some parts of the terrace. The relief on the upper surface of the terrace deposits can sometimes divide individual terrace levels; speculative where the surfaces are immediately adjacent to each other (e.g., in the northeast part of the map near the northern quad boundary). Isolated individual pebbles and cobbles or small accumulations of Quaternary cobbles and pebbles are found over much of the quadrangle and seem to indicate that Qt and Qg deposits may have once been more extensive than at present. Assignment of terrace levels (e.g., Qt1, Qt2) is based solely on height above local grade and may or may not indicate equivalent age in all parts of the quadrangle. Approximately 1–10 m thick.

Qqg

Quaternary quartzite gravel

Deposits of ≈10–65 cm cobbles found in the northwest part of the quadrangle. These gravels are unique in their >99.9% (some Qb cobbles are present) quartzite composition and in the lack of small pebbles. We interpret these gravels as remnants of Rio Chama/Rio Brazos terrace gravels that have been reworked during regional denudation such that small pebbles and fines have been winnowed out leaving only the coarse gravel fraction.

Qb

Brazos Basalt

This silicic alkali basalt (Scott and Marvin, 1985) flow fills a former course of the Rio Brazos (Landis and Dane, 1967). Age is approximately 250 Ka (Scott and Marvin, 1985). The upper surface of the flow has some complex meter-scale relief generated both by erosion of the flow and deposition of variable amounts of Quaternary gravel (see cross section A–A’). Some parts of the flow, as mapped, have no Quaternary gravel on them and probably(?) never have. Approximately 15 m thick, although no good exposure of the base of the flow was found.

TERTIARY SEDIMENTARY ROCKS

Te

El Rito Formation

Poorly exposed; red to whitish; massive; well cemented; very poorly sorted quartzite conglomerate with rare schist and amphibolite clasts and usually containing distinctive quartzite metaconglomerate clasts. Clasts are rounded to subrounded with maximum dimensions >1 m. No outcrops of this unit were found and observations come from large blocky remnants of cemented conglomerate scattered at the surface. These blocks are commonly 1-3 meters but sometimes >5 m in maximum dimensions. Lower contact not exposed but the unit is at least 150 m thick.

CRETACEOUS MARINE AND FLUVIAL ROCKS

Kmf

Menefee Formation.

Tan to light-tan; somewhat friable to weak; fine-grained; thin- to thick-bedded, limey sandstone interbedded with grey to black; friable; limey shale; and coal. Many beds are broadly lenticular, and many sandstone and shale beds are silty. Distinctive cherty-ironstone nodules between about 0.2 and 2.5 cm are found in some beds. Interpreted as lagoonal and terrestrial rocks (Landis and Dane, 1967). Approximately 25–35 m thick.

Kpl

Point Lookout Sandstone

Tan to brownish; fine- to very fine-grained; somewhat friable to weak; thin- to very thick-bedded sandstone. We map the lower contact at the first continuous sandstone bed. The lower ≈10 m of the unit is formed of interbedded 10–20 cm thick sandstone and shale beds. The interbedded sandstone and shale beds are overlain by the "main" cliff-forming sandstone which is about 12–18 m thick. The upper contact is mapped at the base of the first coal beds. Cross-beds indicate sediment transport to the north and east. Approximately 20 m thick.

Kmc

Carlisle Member of Mancos Shale

Very dark-gray to light-gray; somewhat friable; laminated to thinly bedded; slope-forming; sometimes limey shale. In some places, this unit contains oyster-coquina beds and thin, sandstone beds (Landis and Dane, 1967). Just below the Juana Lopez Member (and at some other levels), there are often limestone concretions up to 2 m in diameter. Just above(?) the El Vado Sandstone member, beds and/or lenses of sparry calcite are sometimes found within this member (see the El Vado sandstone description). At least 450 m thick regionally (excluding the interbedded Juana Lopez and El Vado Sandstone Members).

Kmss

Unnamed sandstone member of Mancos Shale

Outcrops of an unnamed sandstone within the Carlisle Member of the Mancos Shale east of Highway 64 and Rito de Tierra Amarilla are poorly exposed, and their outcrop pattern suggests rapidly changing thickness and/or multiple levels of sandstone in the section here. Tan; somewhat friable; fine- to thick-bedded; sometimes limey; fine- to very fine-grained sandstone. These rocks cannot be traced north of about 13S 4060000mN NAD83. These beds may represent an early episode of Point Lookout Sandstone deposition in this area. Between ≈8 and 35(?) m thick.

Kme

El Vado Sandstone Member of the Mancos Shale

Poorly exposed; tan; somewhat friable; thin-bedded; sometimes limey sandstone and interbedded thin sandy limestone and shale(?). Oyster coquina is sometimes found near the top of this unit and/or in the overlying beds of the Carlisle shale. Landis and Dane (1967) included beds(?) or large lenses of massive sparry calcite in this unit. It is not clear if these calcite bodies are continuous and we have therefore only mapped Kme where sandstone is present. Sparse ripple marks indicate sediment transport to the north. The outcrop pattern of this unit indicates significant changes in thickness. The unit varies in thickness from ≈5 to 30(?) m.

Kmjl

Juana Lopez Member of Mancos Shale

Dark-gray, weathering to reddish-orange; moderately strong; laminated to medium-bedded; ripple-marked; shelly, ridge-forming calcarenite interbedded with dark-gray, slope-forming shale. Concretions up to approximately 30 cm are sometimes common. Shale dominates the unit, but the distinctive platy-weathering calcarenites are the distinctive feature of these rocks in the field. Individual calcarenite beds/lenses are often continuous across outcrops but seem to commonly be discontinuous over 10's to 100's of meters. Platey debris is easily transported downslope. For these reasons, the upper and lower contacts can only be approximately located. Calcarenites consist mostly of broken prisms from *Inoceramus* shells along with other bioclastic material (Landis and Dane, 1967). Bedding attitude measurements are rare in this unit due to poor exposure. Approximately 25–40 m thick.

Kmgr

Greenhorn Limestone Member of Mancos Shale

Light- to dark-gray, weathering very light-grey to whitish; very thin- to medium-bedded; dense, finely crystalline, recrystallized; ridge-forming limestone and interbedded shale. The lower contact is sharp. The upper contact, with overlying Carlile Shale, is commonly not exposed. Some small (mm-scale) fish teeth and rare shark teeth up to 2.5 cm are found in some outcrops. Shale interbeds can be up to 20 m thick. Beds of Kmgr along the edges of ridges are commonly displaced by slumping of underlying shale and can give a false impression of bedding attitudes. The underlying Twowells Sandstone Tongue of the Dakota Sandstone is siltier here than to the south on the El Vado Quadrangle and can easily be mistaken for a low bed of Kmgr, but the Twowells is not as reactive in hydrochloric acid, is more platey, and is usually grayer than Kmgr. The unit is approximately 10–35 m thick.

Kmg

Graneros Member of Mancos Shale (including Whitewater Arroyo Shale Tongue of the Mancos Shale and Twowells Sandstone Tongue of the Dakota Sandstone)

Dark-gray to black; laminated to medium-bedded; somewhat friable; slope-forming shale containing locally abundant concretions. The Twowells Sandstone Tongue of the Dakota Sandstone can be correlated in wells regionally, but in the map area, it does not contain the sandstone found in other parts of the San Juan Basin (Owen et al., 2005). The absence of this sandstone makes differentiation of the Whitewater Arroyo Shale Tongue of the Mancos Shale from the Graneros Shale impractical in the map area, so both units are here included in the

Graneros Shale. The Twowells Sandstone Member is possibly identifiable in some outcrops as a few(?) thin, limey silt intervals within the upper part of the mapped Graneros Member. The lower part(?) of the Graneros shale contains characteristic brown-to-red concretions up to about 2 m in diameter but commonly 0.50–1.0 m. These concretions are commonly botryoidal on their surface and their outer parts or usually composed of radially oriented calcite that forms abundant prismatic debris upon weathering. All three members mapped together here are interpreted as offshore-marine deposits (Owen et al., 2005). 40–50m thick.

Kdp

Paguate Member of Dakota Sandstone

Yellowish to tan; moderately strong to strong; moderately well-sorted; subrounded; medium- to thick- bedded; very fine; commonly burrowed arkosic quartz sandstone that is 18–22 m thick. In general, this sandstone is thicker on this quadrangle than on the El Vado Quadrangle to the south. The Paguate Member is interpreted as middle and outer shoreface sands (Owen et al., 2005). Using hand samples it is difficult to distinguish the Paguate Member from the underlying the Cubero Sandstone, but the Cubero is not exposed on this quadrangle.

Cross Section Units

Jm+Jbs+Js

Morrison, Bluff Sandstone, and Summerville Formations undivided—Cross section only. For complete description of the unit, please see the geologic map for Ghost Ranch 7.5-minute quadrangle (OF-GM's 127).

Jt

Todilto Formation

Cross section only. For complete description of the unit, please see the geologic map for Ghost Ranch 7.5-minute quadrangle (OF-GM's 127).

Je

Entrada Formation

Cross section only. For complete description of the unit, please see the geologic map for Ghost Ranch 7.5-minute quadrangle (OF-GM's 127).

TRc

Chinle Formation

Cross section only. For complete description of the unit, please see the geologic map for Ghost Ranch 7.5-minute quadrangle (OF-GM's 127).

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