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U.S. DEPARTMENT OF THE INTERIOR

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PRELIMINARY GEOLOGIC MAP OF THE CAPULIN QUADRANGLE,

ALAMOSA AND CONEJOS COUNTIES, COLORADO

by

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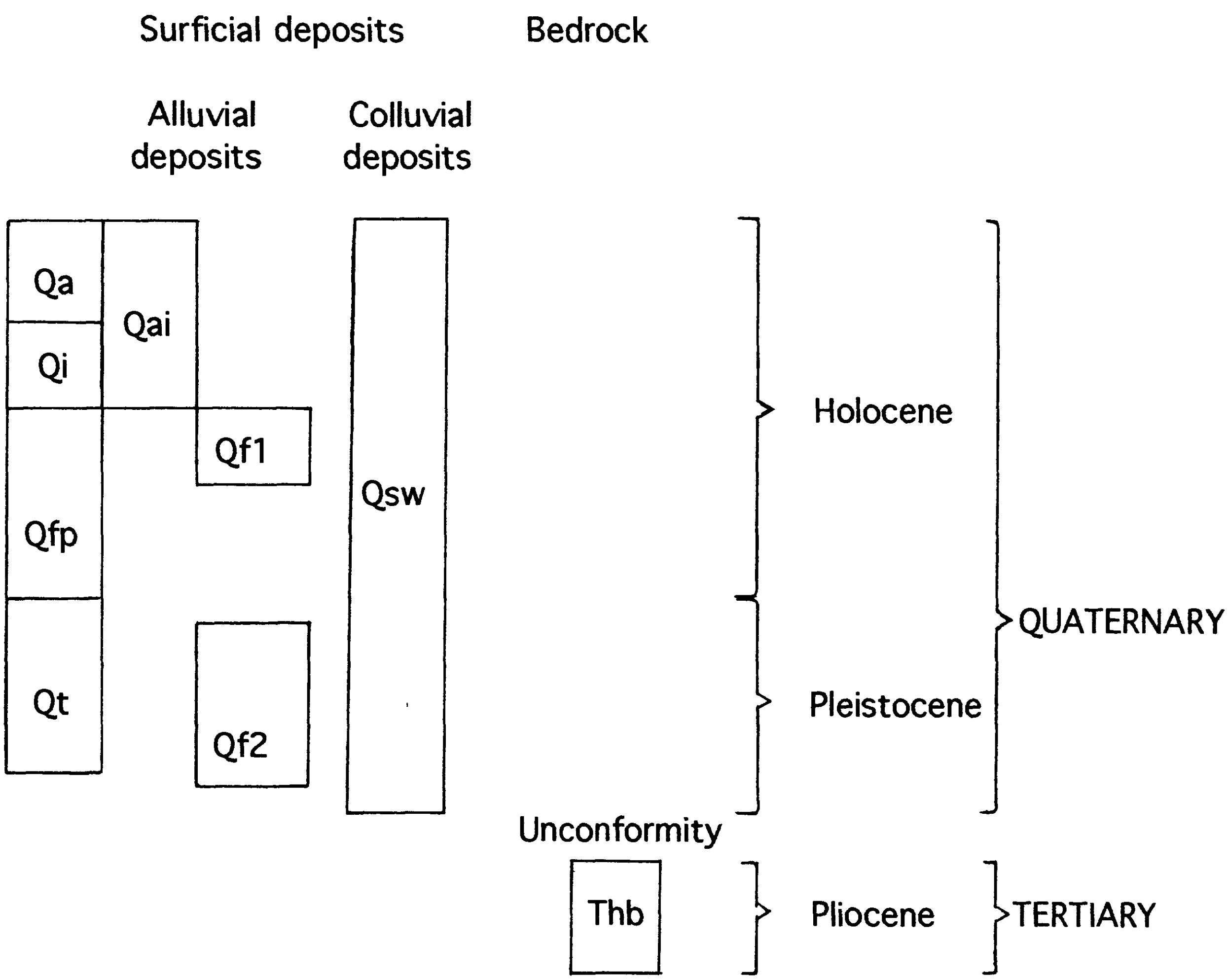
CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

[Surficial deposits shown on this map are estimated to be at least 1 m thick. Thinner deposits are not shown. Minor deposits of artificial fill beneath segments of paved roads and along irrigation ditches, drains, and canals were not mapped. The mapped distribution of the surficial deposits is based primarily on the interpretation of 1:40,000-scale, black-and-white, aerial photographs taken on August 10, 1988 and August 26, 1989. The distribution of these deposits is also based in part on the interpretation of soil maps prepared by the U.S. Soil Conservation Service (Yenter and others, 1980). The contacts between some of the surficial deposits are approximate or are inferred because these deposits have subtle morphologic expression and they are difficult to distinguish in the field and on aerial photographs due to effects of plowing, irrigation, and other agricultural practices. Most of the contacts on the map were transferred from the aerial photographs using a Kern stereoplotter. Most of the surficial deposits in the map area are poorly exposed. All of the unit thicknesses for the surficial deposits are estimates, because their basal contacts are not exposed. Divisions of Pleistocene time correspond to those of Richmond and Fullerton (1986). Age assignments for surficial deposits are based chiefly on the degree of modification of original surface morphology, height above stream level, and degree of soil development. Soil-horizon designations are those of the Soil Survey Staff (l975) and Guthrie and Witty (l982). Most of the surficial deposits are calcareous and contain various amounts of secondary calcium carbonate. Some of the surficial deposits along the Alamosa River, La Jara Creek, and La Jara Arroyo are saline and contain various amounts of salt and gypsum (Yenter and others, 1980). Salt and gypsum are deleterious to uncoated steel and concrete. Stages of secondary calcium carbonate morphology are those of Gile and others (1966). Grain-size terminology is based on visual estimates and follow the modified Wentworth scale (American Geological Institute, 1982). The term clast refers to the fraction greater than 2 mm (0.08 in.) in diameter, whereas the term matrix refers to the fraction less than 2 mm in diameter. The clasts in the surficial deposits in the map area are volcanic rocks that were eroded from the San Juan Mountains (Steven and others, l974), about 9 km west of the map area. The dominant clast lithologies include quartz latite, rhyodacite, andesite, and basalt. Dry matrix colors of the surficial deposits in the map area were determined by comparison with Munsell Soil Color Charts (Munsell Color, 1973). The colors of these deposits are commonly light yellowish brown (2.5Y 6/4), pale yellow (2.5Y 7/4), light brownish gray (10YR 6/2), light gray (10YR 7/2), very pale brown (10YR 7/3 and 7/4), pale brown (10YR 6/3), light yellowish brown (10YR 6/4), and light brown (7.5YR 6/4). Some of the deposits are poorly drained and commonly have gray colors and high-chroma (6 and 8) mottles. Despite the extensive flood-plain deposits in the map area, none of the surficial map units are mantled by loess or eolian sand. However patchy sand on basalt flows (Thb), near the southwestern corner of the map area, may be eolian sand or sheetwash derived from eolian sand. Surficial geology was mapped by R.R. Shroba. Bedrock geology was mapped by R.A. Thompson.]

SURFICIAL DEPOSITS

ALLUVIAL DEPOSITS--Clay, silt, sand, and gravel in stream channels, flood plains, terraces, and alluvial fans along and near the Alamosa River, La Jara Creek, and La Jara Arroyo.

Qa Alluvium in active stream channels (upper Holocene)- -Pebble gravel and cobbly pebble gravel locally overlain by as much as 1.2 m of non-pebbly to pebbly, slightly silty sand within active stream channels incised into flood-plain alluvium (Qfp) along the Alamosa River. The map unit commonly has large gravel bars and steep-sided channels. The unit is prone to periodic flooding; has seasonal high water-table conditions; and contains significant sand and gravel resources. Thickness unknown; possibly 5-10 m

Qai Undifferentiated alluvium in active and inactive stream channels (upper Holocene)--Silty clay to cobbly pebble gravel within active and inactive stream channels incised into flood-plain alluvium (Qfp) along La Jara Creek and La Jara Arroyo. Silt and clay are probably most abundant in the upper part of the inactive stream-channel alluvium. Locally includes minor amounts of flood-plain alluvium (Qfp). The map unit commonly has prominent meander scrolls, ox-bow lakes, and point bars. The unit is prone to periodic flooding; has seasonal high water-table conditions; and may contain significant sand and gravel resources. Thickness unknown; possibly 1-10 m

Qi Alluvium in inactive stream channels (upper Holocene)--Silty clay to cobbly pebble gravel within inactive stream channels incised into flood-plain alluvium (Qfp) along and near the Alamosa River, La Jara Creek, and La Jara Arroyo. The upper part of the map unit probably contains more silt and clay than the lower part. The map unit probably accumulated during flood events on the above streams. Locally includes minor amounts of flood-plain alluvium (Qfp). The map unit commonly has subdued surface expression of abandoned meander channels and point bars, and locally has subdued surface expression of abandoned meander scrolls in the southeastern part of the map area. The unit is prone to periodic flooding; has seasonal high water-table conditions; and may contain significant sand and gravel resources. Thickness unknown; possibly 1-5 m

Qfp Flood-plain alluvium (upper and lower(?) Holocene)--The unit probably consists primarily of pebbly sand to cobbly pebble gravel that is overlain by about 0.2-1.3 m of overbank alluvium. The overbank alluvium consists of poorly to moderately well sorted, stratified, slightly pebbly, silty sand to pebbly sand. A driller`s log for a water well about 350 m east of the map area (SE1/4 NW 1/4 sec. 4, T. 35 N., R. 9 E., in the adjacent La Jara 7.5 minute quadrangle) reports 85 m of clay, interbedded sand, and minor gravel that overlies volcanic rock (Powell, 1958, p. 264, well 35-9-4bc). The sediments at a depth of greater than 10 m are probably alluviums of Pleistocene age or older. Locally includes minor amounts of alluvium in narrow active channels (Qa) and in inactive stream-channels (Qi) along and near the Alamosa River, La Jara Creek, and La Jara Arroyo.

The map unit commonly lacks surface expression of abandoned meander channels, point bars, and meander scrolls. The unit is prone to periodic flooding and has seasonal high water-table conditions. The lower part of the map unit probably contains significant sand and gravel resources. Thickness unknown; possibly 5-10 m

Qf1 Fan alluvium, unit 1 (upper Holocene)--The map unit underlies the surface of a small, eastward-sloping alluvial fan at the southern boundary of the map area. The fan was deposited by a small intermittent stream that was graded to the flood plain (Qfp) along La Jara Arroyo. The unit probably consists primarily of interstratified pebbly sand and pebble gravel. It may contain minor debris-flow or hyperconcentrated-flow deposits and may be locally overlain by thin sheetwash deposits (Qsw). The lack of bar-and-swale surface morphology suggests that the upper part of the unit may be sandy. The unit is prone to periodic flooding; may have seasonal high water-table conditions, and probably lacks significant sand and gravel resources. Thickness unknown; possibly 3-10 m

Qt terrace alluvium (upper Pleistocene)- -Stream alluvium that underlies a terrace along the western boundary of the map area and a small terrace remnant in the central part of the map area that are less than 3 m above the Alamosa River. The unit consists of moderately well sorted, clast-supported, pebble gravel and cobbly pebble gravel with a sand matrix that is overlain by a thin layer of silty sand. The terrace along the western boundary of the map area has well preserved surface expression of bars and channels. The terrace remnant lacks surface expression of these features. The unit may be prone to periodic flooding and may have seasonal high water-table conditions. The terrace along the western boundary of the map area probably contains significant sand and gravel resources. The terrace remnant may contain minor sand and gravel resources. The map unit was probably deposited during the Pinedale glaciation, which occurred about 12,000-35,000 years ago (Richmond, 1986, chart 1A). In the adjacent La Jara 7.5 minute quadrangle this unit is designated Qt1, because an older terrace unit (Qt2) is present (Shroba, 1996). Thickness unknown; possibly 5-10 m

Qf2 Fan alluvium, unit 2 (upper Pleistocene)--The map unit underlies the surface of an extensive, low-gradient, alluvial fan that was deposited primarily by the Alamosa River. In the map area, the fan slopes eastward at about 11 m/km west of the Monte Vista Canal and about 5 m/km east of the canal. The fan is as much as 17 m above the Alamosa River at the western boundary of the map area. The unit consists primarily of stratified, moderately well sorted, clast-supported, pebbly and cobbly gravel with a sand matrix. Thin (1-20 cm) lenses of silt to pebbly sand are locally present. The unit may contain minor debris-flow or hyperconcentrated-flow deposits. Clasts are commonly subangular and subrounded and are as much as 15 cm in intermediate diameter. The upper 0.4 to greater than 1.5

m of the unit consists of slightly pebbly, silty sand. The unit may be locally prone to periodic flooding and may locally have seasonal high water-table conditions. The lower part of the unit contains significant sand and gravel resources that have been mined in two large pits that are about 1 and 3 km north of the map area. The well preserved bar-and-swale surface morphology of the fan west of the Monte Vista Canal as well as the thin argillic B horizons and stage I to weak stage II Cca (Bk) horizons that are formed in the top of the map unit suggest that the map unit was deposited during the Pinedale glaciation (Hall and Shroba, 1993; Thompson and Machette, 1989; Yenter and others, 1980). Driller`s logs for five water wells in and near the map area suggest that the map unit is about 10-15 m thick east of the Monte Vista Canal and is at least 25 m thick west of the canal (Powell, 1958, p. 264-266). In the adjacent La Jara 7.5 minute quadrangle this unit is designated Qf, because a younger fan unit (Qf1) is not present (Shroba, 1996). Maximum exposed thickness 12 m; possibly 10-60 m thick

COLLUVIAL DEPOSITS--Silt, sand, and gravel on hill slopes in the southwestern part of the map area that were mobilized, transported, and deposited primarily by sheet erosion

Qsw Sheetwash deposits (Holocene and Pleistocene)--Mostly pebbly and cobbly, slightly silty sand. The clasts are subangular to subrounded and were eroded from the adjacent basalt flows (Thb). The silty sand may been eroded from the thin (probably mostly less than 50 cm), unmapped mantle of eolian(?) sand that locally overlies the basalt. The map unit locally contains a minor amount of gravelly stream alluvium and may locally overlie flood-plain (Qfp) and terrace (Qt) alluvium. The light reddish brown (5YR 6/4) color and strong stage II carbonate morphology, expressed as carbonate-indurated nodules as much as 10 cm in diameter, in the older deposits in the map unit suggests that these older deposits may have accumulated during the Bull Lake glaciation (Machette, 1985; Thompson and Machette, 1989), which occurred about 140,000-150,000 (Pierce, 1979) or 130,000-300,000 years ago (Richmond, 1986, chart 1A). The unit is locally prone to periodic sheet flooding; may locally have seasonal high water-table conditions; and probably lacks sand and gravel resources. Thickness unknown; possibly 1-5 m

BEDROCK

Thb Hinsdale Formation (Pliocene)--In the map area, includes dark-gray, silicic alkali-olivine basalt flows of the northern flanks of Los Mogotes shield volcano (Lipman, 1975). Sparse small olivine phenocrysts partly altered to iddingsite are typical, weakly developed diktytaxitic groundmass texture is common. As proposed by Lipman and Mehnert (1975), the Hinsdale Formation includes all basaltic rocks interlayered with volcaniclastic rocks of the Los Pinos Formation and predating the voluminous outpouring of tholeiitic Servileta Basalt that underlies the Taos Plateau southeast of the map area. K-Ar ages of east-dipping Hinsdale Formation lava flows southwest of the map area range between 21.6 and 24.6 Ma (Ma, million years) (H.H. Mehnert, unpub. data, 1992). However, rocks mapped regionally as Hinsdale include mafic lava flows as young as 3.9 Ma and as old as 27.5 Ma south and west of the map area (Lipman and others, 1970; Lipman and Mehnert, 1975; H.H. Mehnert, unpub. data, 1992) and to the east in the San Luis Hills (Thompson and others, 1991). Thickness varies locally from 0-300 m.

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Boundary of inactive gravel pits

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CONVERSION FACTORS

Multiply	By	To Obtain
centimeters (cm)	0.3937	inches (in)
meters (m)	3.2808	feet (ft)
kilometers (km)	0.6214	miles (mi)