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F. D. Trauger
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URBAN GEOLOGY OF TUCUMCARI*

by

F. D. TRAUGER
U.S. Geological Survey

INTRODUCTION

Tucumcari, the county seat of Quay County, is situated on a lowland plain within the Canadian basin part of the Pecos Valley section of the Great Plains Province, as described by Fenneman (1931, p. 47). The city in 1970 had a population of about 7,200. Tucumcari is the trade center of a large grazing area and an irrigation farming district that embraces about 40,000 acres. Water for irrigation comes by canal from Conchas Lake, about 30 miles to the northwest. Conchas Lake, and Ute Lake about 20 miles to the northeast, are important recreational areas for which Tucumcari serves as a central supply point. The city also is the junction point of the Southern Pacific and the Chicago, Rock Island, and Pacific railroads. It is also a stopover for large numbers of travelers on U.S. Interstate 40.

The climate of Tucumcari is semiarid and the range in temperature is moderate. Summer temperatures are only occasionally above 100°F and winter temperatures sometimes are below 0°F. The mean annual temperature is 58°F. The average annual precipitation is about 14.5 inches. Most of precipitation falls during the summer. Snowfall averages only about 10 percent of the total annual precipitation.

FOUNDATION STABILITY

The older parts of the city of Tucumcari are built largely on alluvial fill deposited in a structural depression. The fill underlying the city is as much as 600 feet thick locally (Trauger and Bushman, 1964, p. 31) and consists of gravel, coarse to very fine sand, and much clay. The newer residential areas of the city are being extended to the hillsides south and southwest of town. These areas are mostly underlain by shale, mudstone, and sandstone beds of the Morrison Formation of Jurassic age.

The alluvial fill commonly is poorly sorted and well compacted, thus affording a good foundation for most types of structures. Clays within the fill are neither thick nor continuous and are not known to present foundation problems. Some loose, fine to very fine beds of sand found at depth in some wells have proved troublesome in well construction. The alluvial aquifer was virtually dewatered by pumping withdrawals in the period 1900-45 (Trauger and Bushman, 1964, p. 74) yet no land subsidence is known to have occurred. The aquifer has since been recharged by seepage from unlined canals, ditches, and irrigated fields, and it is unlikely that land subsidence in the area will ever be a problem.

The shale and mudstone beds of the Morrison Formation can present severe problems to construction engineers inasmuch as these beds may become plastic when wet. They then tend to move, particularly under load stress. Evidence of slump and mass wasting involving shales and mudstones of the Morrison is evident on all slopes of the surrounding mesas. Some landslide masses extend for nearly a mile along the mesa fronts, and have moved as much as half a mile outward onto the lowland plain. In general the largest slides occur where thick, massive, Mesa Rica Sandstone of Cretaceous age overlies the Morrison. However, slumping and sliding may be anticipated at any place where accelerated erosion or construction steepens the natural stabilized slopes developed on the shales and mudstones of the Morrison.

Structures built on Morrison shale or mudstone slopes should be considered susceptible to slide and slump damage. Annual precipitation in the Tucumcari area averages about 14 inches a year which generally is not enough to cause natural loading of the Morrison mudstones and shales, but application of irrigation water to landscaping could do so, as could disturbances of natural drainages that result in ponding in surfaces underlain by Morrison beds.

MATERIALS

Building materials, particularly gravel aggregate for concrete and roadbed construction, are available locally. Some of the sandstones of the Morrison Formation and the Mesa Rica Sandstone are both strong and esthetically attractive and would be satisfactory for building stone or ornamental facing on both interior or exterior walls that do not require a smooth or polished surface.

WATER RESOURCES

Water resources available to the city of Tucumcari include both surface and ground water. Surface water could be acquired from Conchas Lake with delivery seasonally by way of Conchas canal, or regularly by construction of a separate pipeline facility. This water commonly is hard to very hard and has a high sulfate content, often in excess of the 250 mg/1 (milligrams per liter) recommended by the U.S. Public Health Service (1962) as suitable for drinking water (Hem, 1952, p. 105). Ground water, in moderate to large quantities, is available to the city from wells tapping the Entrada Sandstone of Jurassic age west and southwest of town, and from the alluvium underlying the city. The chemical quality of water from the Entrada Sandstone is good to fair. It is hard to very hard; the sulfate content generally is less than 100 mg/1, except in a few places where seepage from irrigation water from Conchas Lake may have adulterated the water in the aquifer. Water in the alluvium generally is rich in sulfate because it comes largely from irrigation seepage.

A high pollution potential exists for wells in the immediate vicinity of Tucumcari because the surface materials are permeable and water can move downward to the water table almost without restriction. For this reason the disposal of liquid and solid wastes poses a problem. The movement of ground water in the alluvial aquifer underlying the city is toward Tucumcari Lake, on the east side of town (Trauger and Bushman, 1964, p. 79). The lake constitutes a natural sump toward which any contaminant entering the local hydrologic system will move. The Entrada Sandstone west of the city is

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largely a confined aquifer and therefore not susceptible to pollution by surface infiltration.

NATURAL DISASTER POTENTIALS

Of mounting concern in urban areas is the potential for natural disasters such as earthquakes, floods, and tornadoes. Tornadoes are not generally considered to be phenomena dependent upon geology, but the form of the land, resulting from geologic processes, does to a large degree control the local occurrence and severity of tornadoes. Tucumcari lies more or less sheltered by surrounding mesa and table lands, and thus can expect to be relatively free of the severe tornadic storms common on the more open plains to the immediate east.

Floods are another phenomena unlikely to occur in Tucumcari. The city lies well above the flood plain of any river or stream of consequence. Some damaging sheet wash may occur locally in the hill-slope areas as a result of intense thunderstorm activity. Cloudbursts may surprise some who build homes on land where inconspicuous drainageways may have been graded to provide a building site.

Earthquakes have occurred in the region (see Northrop and Sanford, this Guidebook) and while no damaging earthquakes have been recorded the potential exists and should be considered when structural designs are made.

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