

The Longmont quadrangle is in the northern part of the Colorado Piedmont, which is a section of the Great Plains that is bounded on the west by the Front Range and on the east by the High Plains section of the Great Plains. It is distinguished primarily by the fact that it has been stripped of the Miocene fluvial rocks (Arikaree and Ogallala Formations) that cover most of the High Plains (Fenneman, 1931). Headward erosion of the South Platte and Arkansas Rivers and their tributaries caused most of the stripping. Like much of the Colorado Piedmont, the Longmont quadrangle is an area of low hills and plains underlain by Upper Cretaceous (100–66 million yr ago) sedimentary rocks. Most of these rocks consist of fine-grained sediment (clay, silt, and fine sand) that accumulated in a broad seaway (Western Interior Seaway). This seaway connected the areas of the present-day Arctic Ocean and the Gulf of Mexico and extended from Minnesota and western Iowa on the east to central Utah on the west.

Even before urbanization, Upper Cretaceous bedrock was exposed in only a few places in the Longmont quadrangle because loess (windblown silt and fine sand; unit Qe) of late Pleistocene age (126,000 to 11,700 yr ago) blankets about 85 percent of the area. Deposition of most loess is attributed to northwesterly winds, which during the last glaciation (time between about 40,000 and 12,000 yr ago) were stronger than they are today, blowing across extensive areas upwind from the Longmont quadrangle that are underlain by siltstone, mudstone, and shale. Thus, eolian sediment covers almost all bedrock and surficial deposits (loose, uncemented sediment as opposed to rock) that were at the surface prior to the end of the last glaciation. The floors of the major streams in the Longmont quadrangle also bear the imprint of Pleistocene glaciations. The gravel deposits that are mined in several places along the St. Vrain and Boulder Creeks consist mostly of granitic and gneissic rocks that were derived from the Front Range and transported to the piedmont during glaciations. The headwaters of the St. Vrain, Lefthand, and Boulder Creeks were glaciated repeatedly during Pleistocene time. The principal glaciers in these areas were 10–12 miles long and as much as 600–1150 ft thick (Madole and others, 1998).

Not only do gravel deposits underlie valley floors in the Longmont quadrangle, they also cap some of the highest terrain in the area. The ages of some hilltop gravel deposits exceed several hundred thousand years. Deposits of middle Pleistocene (781,000 to 126,000 yr ago) gravel underlie hills and ridges in the central and southern parts of the quadrangle. The highland at and beyond the southern boundary of the quadrangle is in some places underlain at depth by gravel that is possibly more than a million years old. These hilltop gravel deposits are remnants of ancient valley floors now topographically inverted; that is, the former valley floors are now ridges or hills. The ridge trending from northwest to southeast in the west-central part of the quadrangle is capped by gravel (overlain by a thin cover of loess) that was deposited by an ancestral Little Thompson River. The lowland paralleling this ridge on its southwest side also is underlain by alluvium deposited by the ancestral Little Thompson River, now covered by windblown sediment and sheetwash alluvium. The area known as The Slough is in this paleovalley near its former confluence with an ancestral St. Vrain Creek. Topographic inversion and stream piracy, the process that beheaded the Little Thompson River and diverted it eastward, are common in areas where coarse-grained alluvium is transferred from mountains (particularly those that have cores of hard crystalline rock) into adjacent basins or piedmonts underlain by easily eroded rocks, such as shale, mudstone, and siltstone (Ritter, 1967, 1991).

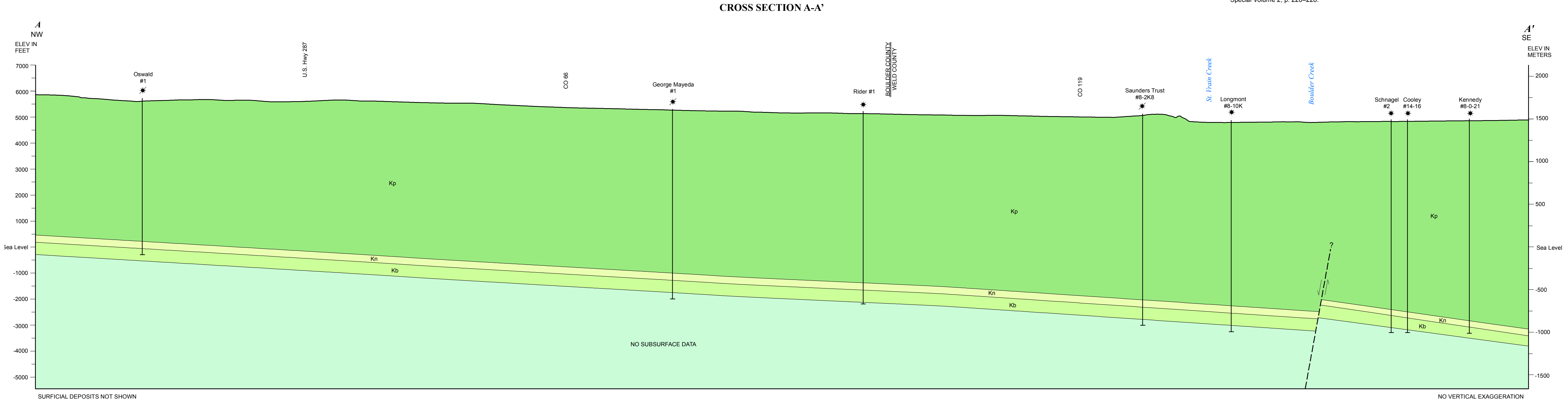
Topographic inversion occurs because gravel is more resistant to erosion than the fine-grained rock that formed the valley walls. Consequently, when the base levels of the St. Vrain Creek and Boulder Creek lowered, stream incision (erosion) occurred mainly in the relatively soft fine-grained rock along valley edges rather than in the gravel mantling the valley floor. Eventually, the stream cut a new valley floor adjacent to its former valley, at which time the former valley floor became a gravel-capped stream terrace.

References Cited
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GEOLOGIC MAP OF THE LONGMONT QUADRANGLE, BOULDER AND WELD COUNTIES, COLORADO
CORRELATION OF MAP UNITS, 3-D MAP, GEOLOGIC HISTORY, AND CROSS SECTION

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