














By Alexander E. Marr  
2024

In the Steve Sharp Crane and Rigging borrow pit, the deposit that includes sample MR037C14 is truncated to the east against the underlying unit Qg. The deposit within sample MR037B14 has a channel shape and appears to dip to the east and truncates and overlies the unit with sample MR037C14 south. This stratigraphic relationship is supported by bulk  $^{14}\text{C}$  dates taken from both units. Sample MR037B14 has a date of  $8.560 \pm 0.30$  "yr BP, and MR037C14 has a date of  $13.890 \pm 0.40$  "yr BP (See Table 1 in Plate 2), which may correlate with Yoneda's (1978) Broadway Alluvium that was deposited during the Pinedale Glaciation (12-30 ky). According to Colwell (1978), Piney Creek Alluvium occurs the wetlands on the northern side of the Milton River dam. This unit has been recently mapped as Qg, along the Milton River and its major tributaries by the Colorado Geological Survey maps. In the El Estero quadrangle unit, Qg has two OSL age estimates which yield at  $3.040 \pm 2.00$  and  $3.020 \pm$

**Laramie Formation (Upper Cretaceous)**—Shale, calcareous fine- to medium-grained sandstone, siltstone, clay, carbonaceous shale, and, vertically stratified coal beds about 1 m thick. The Laramie nodules are 10–20 cm in diameter and are composed of a variety of minerals, many as submillimetric coal beds occur; individual beds are 0.6–1.8 m thick. Historic coal mines are present in the map area where mine workings advanced through the thinning and increasing surficial depth of the coal beds. The Laramie Formation is 10–15 m thick at the surface and 58 m of the unit. The uppermost of these is the “B” sandstone which is about 12–18 m thick. The lowest part of the Laramie Formation along with the underlying Fox Hills and the underlying sandstone makes the Fox Hills-Laramie aquifer, which serves as a principal bedrock aquifer of the Denver basin. The Laramie Formation is overlain by the Pierre and the Laramie Formation was observed at the bottom of the borrow pit near the WCR32 and WCR37 split section. The bedrock was originally overlain by unit Qg which was removed by the borrow pit operation. The bedrock is composed of sandstone and shale and contains about 20% fine sand. Calc carbonate nodules range from less than 1 to 2 mm and there are bands of iron oxide, mostly about 3 mm thick but locally as thick as 14 mm. Although the nodules are in situ in unit Qg, they are not in place. The nodules are composed of a variety of minerals, Qg gravel that overlies this unit. Cross section A-A shows Laramie Formation.

                   	<p><b>Water well</b> — Division of Water Resources permit number shown on map</p> <p><b>Oil and gas well</b> —        Label is the American Petroleum Institute (API) Unique Well Identifier. Label does not include preceding State Circle (IS) and County Circle (123 for Weld County)</p> <p><b>Geotechnical soil borehole</b></p> <p><b>Radiocarbon <sup>14</sup>C sample site</b></p> <p><b>Optically Stimulated Luminescence (OSL) sample site</b></p> <p><b>Coal mine</b></p> <p><b>Borrow pit</b></p> <p><b>Crest of major dunes</b></p> <p><b>Contact</b> — Approximately located</p> <p><b>Contact, Inferred</b> — Buried contact between units PeKd and K1 (modified from DeChesne and others, 2011)</p> <p><b>Alignment of cross section</b></p> <p><b>Eolian blowout</b></p> <p><b>Paleovalley of the ancestral South Platte River</b>        (modified from Robson and others, 2000)</p>
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The Denver Formation of Palaeocene and Upper Cretaceous age is the youngest bedrock unit present in the Milton Reservoir quadrangle and overlies the Laramie Formation (Dechessne and others, 2001). Bedrock in the Denver Formation is composed of sandstone, siltstone, shale, and claystone. The Denver Formation contains residual mudstone and siltstone that transition upwards into the unconsolidated sediment (Robson and others, 2000). The only location where bedrock was observed during this investigation is at the bottom of the borrow pit near the northeast corner of the borrow area. The bedrock is composed of sandstone and siltstone that transition into restrictive layer from the Natural Resources Conservation Service (NRCS) soils map of southern Utah County (Crabb, 1980). This map shows bedrock to be at shallow depths (average depth about 80 cm) beneath the surface of the Denver and Laramie formations. The Denver Formation is defined by its composition and color. A conglomerate lying below the Denver Formation is more poorly defined in the Denver Formation than the conglomerates are not present. The nearest definable contact between the Denver and Laramie formations is in the southeast portion of the Plateville quadrangle; about 3 km from the Milton Reservoir quadrangle (Sosterson and others, 1967). The boundary between the Denver and Laramie formations is not clearly defined (Ludwig, 1979), making it difficult to differentiate between them in the subsurface. Dechessne and others (2001) differentiated the two units by identifying the Laramie formation as fine grained and Denver as coarse grained. The Denver Formation is composed of sandstone, siltstone, shale, and claystone. The Denver Formation in the Milton Reservoir quadrangle is taken from Sostser (1965a, 1965b, 1965c), who mapped the surrounding Fort Lupton, Hudson, and Plateville quadrangles south on the Plate 1 map. The Plateville quadrangle is located to the east of the Milton Reservoir quadrangle. The Laramie Formation is located to the west of the Milton Reservoir quadrangle. The Laramie Formation is derived from the Plateville quadrangle map (Sostser, 1965b).

**Laramie Formation (Upper Cretaceous)**—Shale, calcareous fine- to medium-grained sandstone, siltstone, clay, carbonaceous shale, and, vertically stratified coal beds about 1 m thick. The Laramie nodules are 10–20 cm in diameter and are composed of a variety of materials, many as submillimetric coal beds occur; individual beds are 0.6–1.8 m thick. Historic coal mines are present in the map area where mine workings advanced through the thinning and increasing surficial depth of the coal beds. The Laramie Formation is 58–80 m thick. The uppermost of these is the “B” sandstone which is about 12–18 m thick. The lowest part of the Laramie Formation along with the underlying Fox Hills sandstone makes the Fox Hills-Laramie aquifer, which serves as a principal bedrock aquifer of the Denver basin. The Laramie Formation is overlain by the Cretaceous Fox Hills sandstone. The Laramie Formation was observed at the bottom of the borrow pit near the WCR32 and WCR37 split section. The bedrock was originally overlain by unit Qg which was removed by the borrow pit operation. The bedrock is composed of sandstone and shale with about 20% fine sand. Calc carbonate nodules range from less than 1 to 2 mm and there are bands of iron oxide, mostly about 3 mm thick but locally as thick as 14 mm. Although the nodules are in situ in unit Qg, they are not in place. The nodules are composed of unit Qg, gravel that overlies this unit. Cross section A-A shows Laramie Formation.