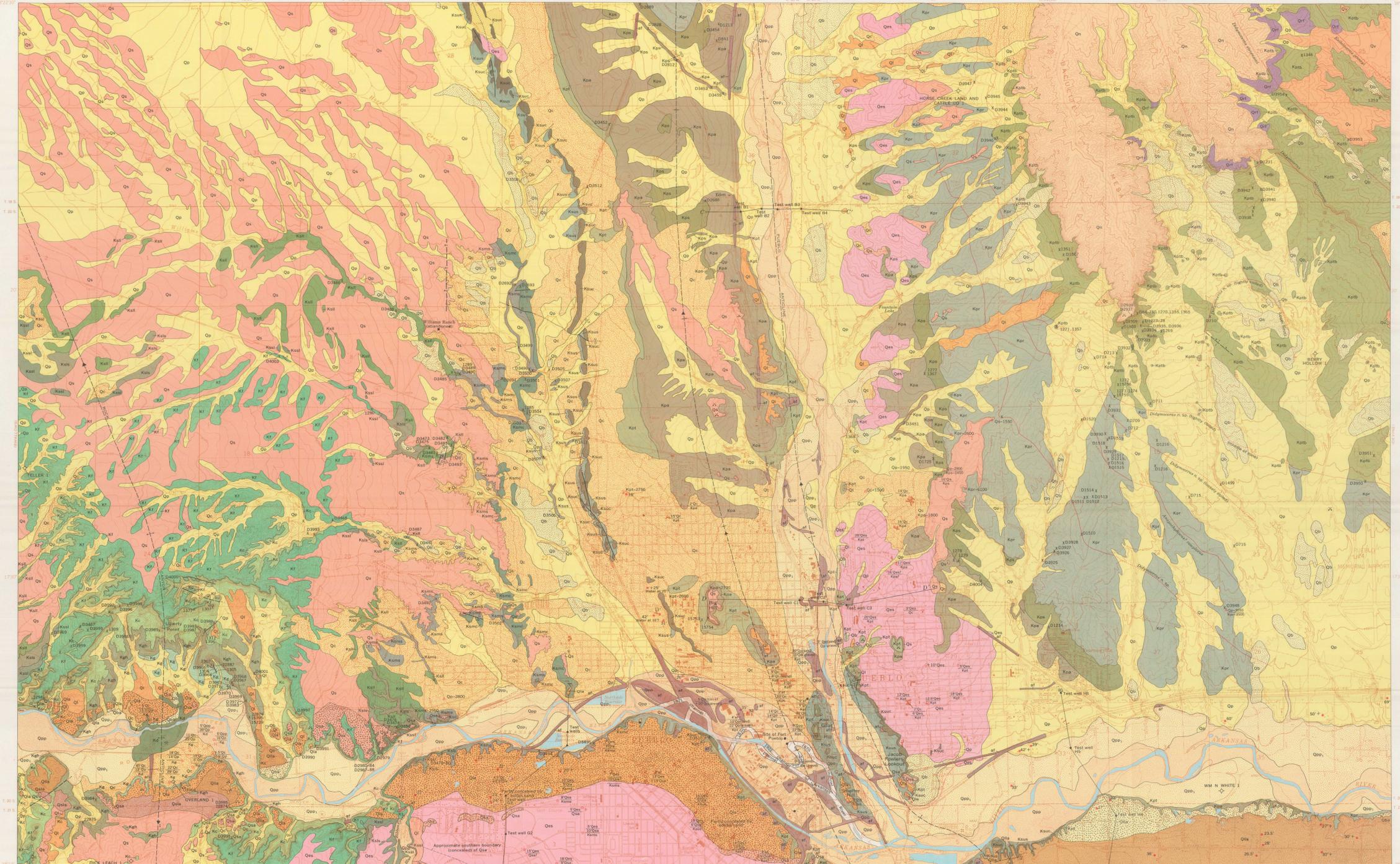


STRATIGRAPHIC SECTION

Measured in secs. 24, and 25, T. 20 S., R. 65 W., sec. 22-36, T. 20 S., R. 65 W., sec. 14, 22, 25, and 26, T. 19 S., R. 65 W., sec. 2, 10, 15, 16, and 21, T. 20 S., R. 64 W., and sec. 9, 10, and 35, T. 19 S., R. 64 W.

FORMATION	MEMBER, UNIT AND SUBUNIT	FOSSIL ASSEMBLAGE ZONE <sup>1</sup> AND LOCALITY NUMBER	LITHOLOGY	THICKNESS (FEET)	DESCRIPTION
Pine Shale (unconformity)	Dolomereus stream	0120	[Symbol]	625+	Olive gray shale containing yellowish-orange sandstone concretions and small masses of gray calcareous shale in upper part. Contains thin conical shells locally called "tepee buttons". Shale is tan-brown 100 and 400 ft above base.
	Dolomereus reference	0121-0129	[Symbol]		
	Dolomereus n. sp. slightly coiled	0130-0139	[Symbol]		
	Dolomereus n. sp. loosely coiled	0140-0149	[Symbol]		
	Dolomereus n. sp. moderately coiled	0150-0159	[Symbol]		
	Dolomereus n. sp. moderately coiled	0160-0169	[Symbol]		
	Dolomereus n. sp. moderately coiled	0170-0179	[Symbol]		
	Dolomereus n. sp. moderately coiled	0180-0189	[Symbol]		
	Dolomereus n. sp. moderately coiled	0190-0199	[Symbol]		
	Dolomereus n. sp. moderately coiled	0200-0209	[Symbol]		
Niobrara Formation	Upper cherty unit	0210-0219	[Symbol]	440	Olive gray shale containing abundant yellowish-orange sandstone concretions and thin layers of olive gray limestone concretions in upper part, and unit of gray shale containing sandstone beds and limestone concretions 60 to 90 ft above base.
	Shannon Springs Member	0220-0229	[Symbol]	113	Upper 75 feet of medium-light gray medium-bed silty shale, which consists of shaly hard silty shale containing siliceous concretions and thin layers of sandstone and siliceous concretions throughout. Contains bryozoan beds between 50 and 60 ft above base that may be equivalent to the Ardmore Bryozoa Bed (Coburn 1962).
	Apache Creek Sandstone Member	0230-0239	[Symbol]	200	Yellowish-gray platy graniferous sandy shale and thin platy beds of sandstone. Contains sandstone concretions and concretions of limestone beds.
	Transition member	0240-0249	[Symbol]	228	Upper 78 ft of olive-gray sandstone, silty micaceous shale, lower 150 ft is light-brown sandstone, silty shale and light-brown gray sandstone calcareous silty shale.
	Concretionary sandstone	0250-0259	[Symbol]	263	Olive-black blocky ledge-forming chert that weathers dark yellowish orange.
	Upper cherty shale unit	0260-0269	[Symbol]	283	Olive-gray graniferous sandstone calcareous shale and yellowish-gray silty shale in upper part, olive limestone beds in lower part.
	Middle cherty shale unit	0270-0279	[Symbol]	28	Yellowish-gray platy ledge-forming chert containing siliceous nodules.
	Concretionary sandstone	0280-0289	[Symbol]	127	Light-brown gray platy graniferous calcareous shale containing limestone concretions 30 to 60 ft below top, sandy shale 150 to 190 ft above base, and platy limestone at base.
	Sandy shale unit	0290-0299	[Symbol]	283	Light-brown gray platy graniferous calcareous shale containing limestone concretions 30 to 60 ft below top, sandy shale 150 to 190 ft above base, and platy limestone at base.
	Middle shale unit	0300-0309	[Symbol]	283	Light-brown gray platy graniferous calcareous shale containing limestone concretions 30 to 60 ft below top, sandy shale 150 to 190 ft above base, and platy limestone at base.
Carlisle Shale	Lower limestone unit	0310-0319	[Symbol]	88	Dark gray platy hard ledge-forming limestone in about 16 beds, separated by light-brown gray silty shale containing brownish-stained epigenetic lenses. Contains alternating cycles of thick and thin beds in lower part.
	Lower shale unit	0320-0329	[Symbol]	55	Yellowish-brown silty to earthy calcareous shale containing thin beds of silty limestone and micaceous argillaceous lenses.
	Shale and limestone unit	0330-0339	[Symbol]	31	About 18 beds of gray dense ledge-forming limestone separated by soft calcareous shale.
	Fort Hope Limestone Member	0340-0349	[Symbol]	40	Dark gray platy hard ledge-forming limestone in about 16 beds, separated by light-brown gray silty shale containing brownish-stained epigenetic lenses. Contains alternating cycles of thick and thin beds in lower part.
	Upper cherty shale unit	0350-0359	[Symbol]	101	Yellowish-gray massive to platy cherty limestone is silty and contains spherical concretions in lower part.
	Blue Hill Shale Member	0360-0369	[Symbol]	232	Dark gray hard to earthy shale, upper part sandy and contains two prominent layers of large spheroidal concretions.
	Farquhar Cherty Shale Member	0370-0379	[Symbol]	99	Gray to yellowish-brown soft banded platy calcareous shale.
	Bridge Creek Limestone Member	0380-0389	[Symbol]	52	About 26 gray hard silty weathering limestone beds separated by soft calcareous shale and sandstone lenses.
	Harland Shale Member	0390-0399	[Symbol]	149	Dark gray calcareous platy shale and thin layers of calcareous limestone in part of top of Harland and part of Niobrara shale.
	Lincoln Limestone Member	0400-0409	[Symbol]	38	Layers of dark gray platy silty calcareous limestone in part of top of Harland and part of Niobrara shale.
Graneros Shale	Upper cherty shale unit	0410-0419	[Symbol]	103	Dark gray massive to platy cherty limestone is silty and contains spherical concretions in lower part.
	Lower limestone unit	0420-0429	[Symbol]	40	Dark gray platy hard ledge-forming limestone in about 16 beds, separated by light-brown gray silty shale containing brownish-stained epigenetic lenses. Contains alternating cycles of thick and thin beds in lower part.
	Lower shale unit	0430-0439	[Symbol]	55	Yellowish-brown silty to earthy calcareous shale containing thin beds of silty limestone and micaceous argillaceous lenses.
	Shale and limestone unit	0440-0449	[Symbol]	31	About 18 beds of gray dense ledge-forming limestone separated by soft calcareous shale.
	Fort Hope Limestone Member	0450-0459	[Symbol]	40	Dark gray platy hard ledge-forming limestone in about 16 beds, separated by light-brown gray silty shale containing brownish-stained epigenetic lenses. Contains alternating cycles of thick and thin beds in lower part.
	Upper cherty shale unit	0460-0469	[Symbol]	101	Yellowish-gray massive to platy cherty limestone is silty and contains spherical concretions in lower part.
	Blue Hill Shale Member	0470-0479	[Symbol]	232	Dark gray hard to earthy shale, upper part sandy and contains two prominent layers of large spheroidal concretions.
	Farquhar Cherty Shale Member	0480-0489	[Symbol]	99	Gray to yellowish-brown soft banded platy calcareous shale.
	Bridge Creek Limestone Member	0490-0499	[Symbol]	52	About 26 gray hard silty weathering limestone beds separated by soft calcareous shale and sandstone lenses.
	Harland Shale Member	0500-0509	[Symbol]	149	Dark gray calcareous platy shale and thin layers of calcareous limestone in part of top of Harland and part of Niobrara shale.



EXPLANATION OF NONSTANDARD SYMBOLS USED FOR MINOR LITHOLOGIES IN LITHOLOGY COLUMN

[Symbol]	Bentonite	[Symbol]	Ironstone	[Symbol]	Serpentine
[Symbol]	Caliche	[Symbol]	Ironstone concretion	[Symbol]	Ironstone concretion
[Symbol]	Caliche concretion	[Symbol]	Ironstone concretion	[Symbol]	Ironstone concretion
[Symbol]	Caliche concretion	[Symbol]	Ironstone concretion	[Symbol]	Ironstone concretion

EXPLANATION

Artificial fill: Dashed where approximately located

Post-Pine Creek alluvium: Yellowish-brown silty clay and clay containing pebbles, sand, and silt forming flood plain and lower terrace deposits along major streams. Generally less than 10 feet thick. Surface lies 10 to 15 feet above modern stream level. Contains carbonaceous material intermediate between Pine Creek Alluvium and post-Pine Creek alluvium.

Colluvium: Yellowish-brown silty and clay containing pebbles, angular blocks of limestone, and sandstone derived from underlying bedrock and surficial deposits. Locally includes small fragments of older colluvium.

Pine Creek Alluvium: Yellowish-brown silty and clay along most valleys in area. Contains lenses of sand and pebbles in lower part. Locally 10 feet thick. Surface lies about 10 feet above modern stream level. Contains carbonaceous material intermediate between Pine Creek Alluvium and post-Pine Creek alluvium.

Rollin sand: Yellowish-brown fine to coarse sand in rounded beds east of Pine Creek and south of the Arkansas River. Locally along where mixed with colluvium. Locally more than 20 feet thick. Contains carbonaceous material "A-Horizon" Brown soil moderately developed in upper part of sand.

Broadway Alluvium: About 10 feet thick. Surface lies about 10 feet above modern stream level. Contains carbonaceous material intermediate between Pine Creek Alluvium and post-Pine Creek alluvium. Qb, coarse silt along Arkansas River.

Lower Alluvium: About 20 feet thick. Surface lies 10-30 feet above modern stream level. Contains carbonaceous material intermediate between Pine Creek Alluvium and post-Pine Creek alluvium. Qc, calcareous silt containing small pieces of limestone and coarse sand deposited by local streams. Qc, yellowish-brown coarse silt along Arkansas River origin. Qc, gray of Arkansas River origin overlain by calcareous silt of local origin.

Upper Alluvium: About 35 feet thick. Surface lies 120-150 feet above modern stream level. Contains carbonaceous material intermediate between Pine Creek Alluvium and post-Pine Creek alluvium. Qd, calcareous silt containing small pieces of limestone and coarse sand deposited by local streams. Qd, yellowish-brown coarse silt along Arkansas River origin. Qd, gray of Arkansas River origin overlain by calcareous silt of local origin.

Vendoc Alluvium: Grayish-brown calcareous silt and coarse sand or calcareous silt with small pieces of limestone on pediments. Present only on level stream beds. About 10 feet thick. Surface lies 200-250 feet above modern stream level.

Rocky Flats Alluvium: Grayish-brown silty pebbly gravel along west side of Rocky Flats. Thickness as much as 100 feet. Surface lies 200-250 feet above modern stream level.

Nasbaum Alluvium: Moderate-yellowish-brown well-sorted pebbly gravel on Rocky Flats. Thickness as much as 100 feet. Surface lies 200-250 feet above modern stream level.

Pine Shale: Kps, Type zone of Gilbert (1897) Kar, Shaly zone of Gilbert (1897) Kca, Shaly zone of Gilbert (1897) Kpt, Fracture member

Niobrara Formation: Shaly shale member: Kca, upper cherty shale unit; Kcm, upper cherty shale unit; Kcs, middle cherty shale unit; Kcd, lower limestone unit; Kce, lower shale unit; Kcf, cherty limestone unit; Kcg, Fort Hope Limestone Member

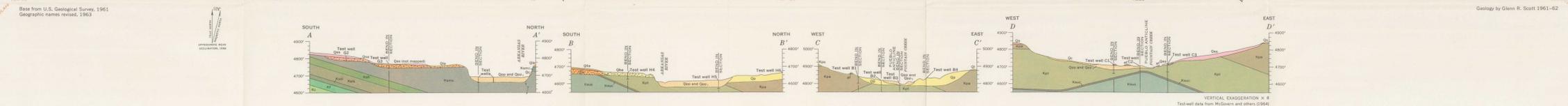
Carlisle Shale: Kcu, Fort Hope Limestone Member

Graneros Limestone: Kch, Bridge Creek Limestone, Harland Shale, and Lincoln Limestone Members

Dakota Sandstone: Kcd, lower limestone unit; Kce, lower shale unit; Kcf, cherty limestone unit; Kcg, Fort Hope Limestone Member

Geologic symbols: United Soil Classification symbol (U.S. Army Corps of Engineers, 1953; U.S. Bureau of Reclamation, 1960)

Geology by Glen R. Scott 1961-62



GEOLOGIC MAP OF THE NORTHWEST AND NORTHEAST PUEBLO QUADRANGLES, COLORADO



CONTOUR INTERVAL 10 FEET  
DATUM IS MEAN SEA LEVEL