



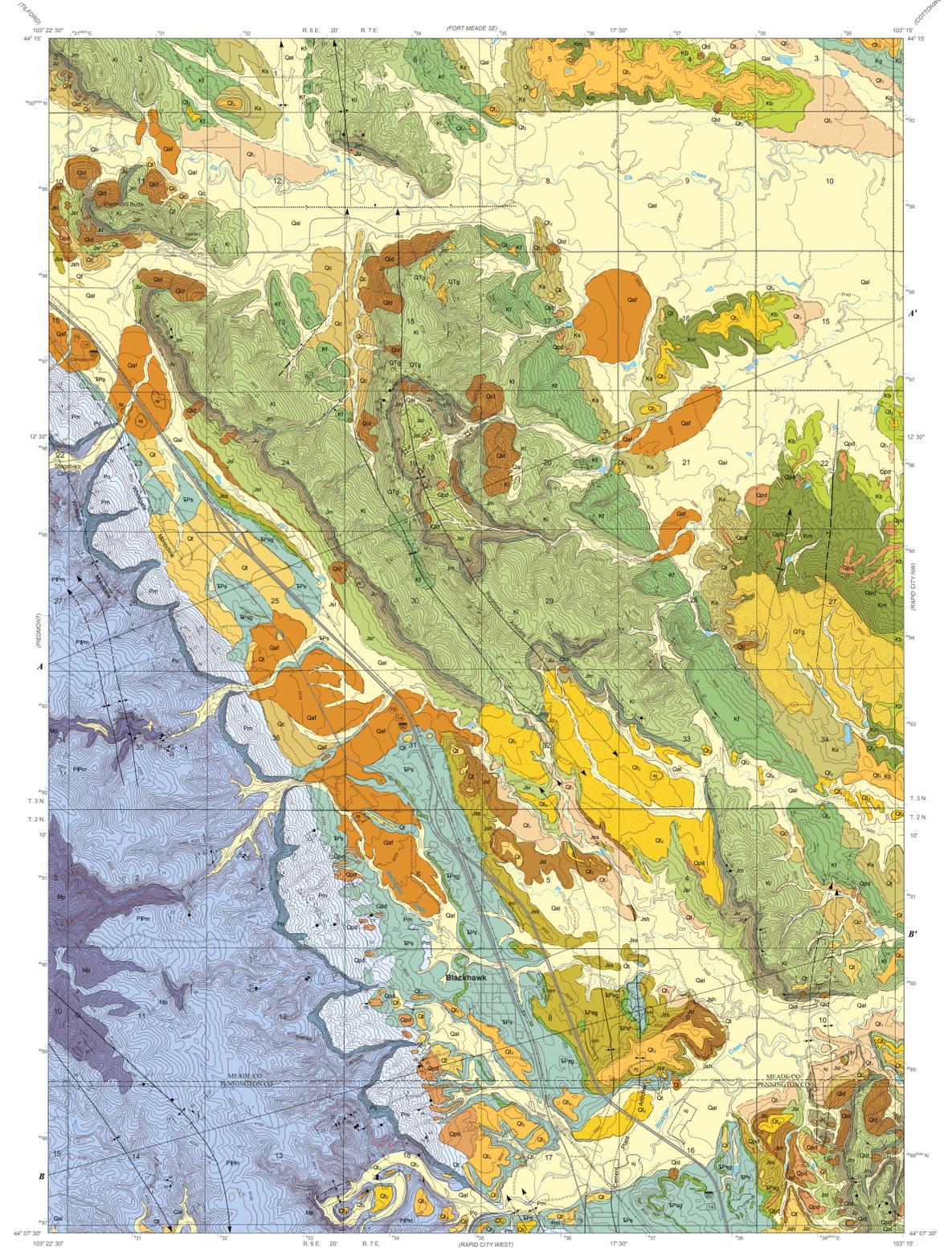
Geologic Map of the Blackhawk Quadrangle, South Dakota

By
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2005

State of South Dakota
M. Michael Rounds, Governor

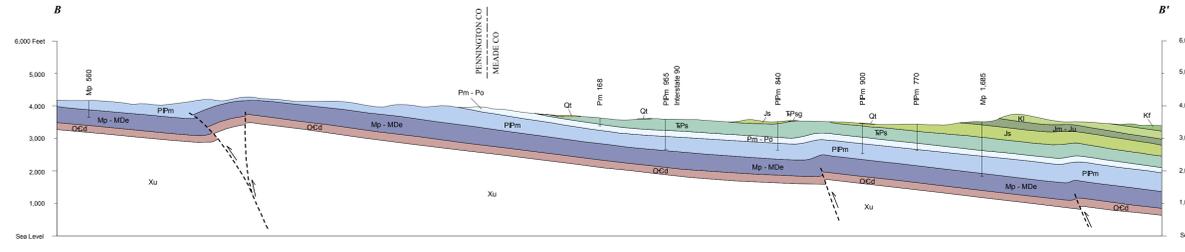
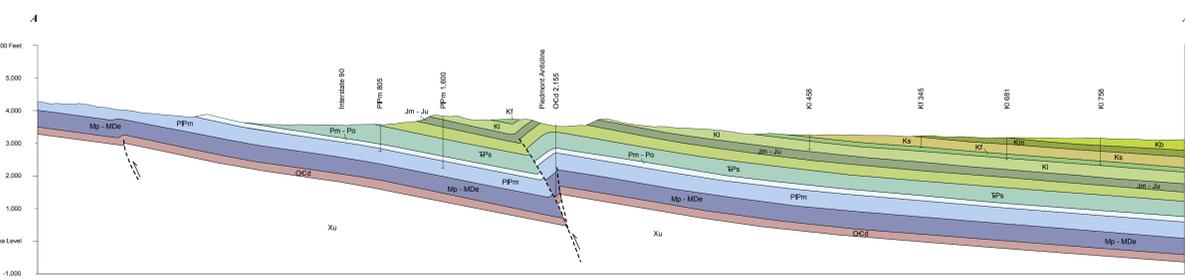
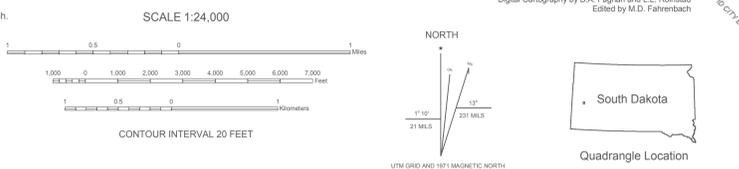
South Dakota Geological Survey
Derric L. Iles, State Geologist

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Map base modified from U.S. Geological Survey 1:24,000-scale Blackhawk digital line graph. Projection is Universal Transverse Mercator, Zone 13. Datum is 1983 North American.

The Geological Survey, Department of Environment and Natural Resources engages in an ongoing data collection and interpretation process. An outcome of that process is to reflect those interpretations on maps such as this one. Reasonable efforts have been made to ensure that this map accurately reflects the source data used in its preparation. This map is date specific. As additional data become available, geologic interpretations may be revised and the map may be updated by the Geological Survey. This map should not be enlarged or otherwise used in an attempt to interpret more detail than can be seen at the 1:24,000 scale.



EXPLANATION

	Alluvium - Unconsolidated to loosely consolidated, clay, silty sand, and lenses of gravel. Thickness locally greater than 20 ft (6 m)		Contact Dashed where approximately located
	Terrace deposit (undifferentiated) - Unconsolidated clay- to boulder-sized clasts deposited approximately 40 ft (12 m) above present-day streams		FOLDS Anticline Showing crestline and direction of plunge. Dashed where approximately located; dotted where concealed
	Terrace deposit - Unconsolidated to loosely consolidated, clay- to boulder-sized clasts deposited approximately 60 ft (18 m) above major drainages, may be less along tributaries		Syncline Showing troughline and direction of plunge. Dashed where approximately located; dotted where concealed
	Terrace deposit - Unconsolidated to loosely consolidated, sand and gravel capping ridges along major drainages. Deposited approximately 80 - 100 ft (24 - 30 m) above major drainages, may be less along tributaries. Locally quarried for sand and gravel. Approximate maximum thickness is 33 ft (10 m)		Monocline, anticlinal bend Shorter arrow indicates steeper beds. Dashed where approximately located; dotted where concealed
	Colluvium - Unstratified clay- to cobble-sized clasts that form gentle slopes. Composed of locally derived material		Monocline, synclinal bend Shorter arrow indicates steeper beds. Dashed where approximately located; dotted where concealed
	Pediment - Unconsolidated to loosely consolidated clay, sand, and gravel that form elongated, gentle slopes		FAULTS Fault Dashed where approximately located; dotted where concealed; quartered where probable. Bar and tail on downthrown side
	Alluvial fan - Unconsolidated to loosely consolidated, clay- to boulder-sized clasts. Located proximal to present-day drainages		STRIKE AND DIP OF BEDDING Horizontal
	Landslide - Unconsolidated blocks of debris consisting of local bedrock material. Contacts with units define individual lobes. Primarily associated with the Lakota Formation and Skull Creek Shale. Stipple pattern denotes debris flows; solid color denotes rotational slumps		STRIKE AND DIP OF FRACTURES Inclined Vertical Multiple
	Terrace deposit - Unconsolidated to loosely consolidated, clay- to boulder-sized clasts comprised of Precambrian quartzite and metachert, and Paleozoic carbonate and clastic rocks. Approximate maximum thickness is 33 ft (10 m)		KARST FEATURE Solution breccia Breccia pipe
	Unconformity		OTHER FEATURES Open pit mine Open pit mine or quarry Dry Hole - Petroleum test Drill Hole
	Carlile Shale - Gray, silty shale; basal portion poorly exposed in the northeast corner of the quadrangle		
	Greenhorn Limestone - Consists of a lower shale and upper limestone; poorly exposed in the northeast corner of the quadrangle. The lower shale is gray to dark-gray, silty, and calcareous, with beds of bentonite and limestone. The upper limestone is thin-bedded, contains abundant <i>Inoceramus</i> sp. fossils, and forms a ridge that weathers to light-gray slabs. The limestone beds alternate with thin, gray shale. Total thickness of 500 ft (150 m) is reported in the adjacent Rapid City Northwest quadrangle (McGregor and Cattermole, 1973)		
	Belle Fourche Shale - Dark-gray shale with thin bentonite beds. The basal contact locally contains thin, strongly bioturbated, calcarenite beds composed of echinoid spines, pelecypods, and minor quartz grains. The basal 50 ft (15 m) contains iron-manganese concretions up to 5 ft (1.5 m) in diameter that weather to pebble-sized fragments. A thickness greater than 260 ft (81 m) is reported to the east in the adjacent Rapid City Northwest quadrangle (McGregor and Cattermole, 1973)		
	Mowry Shale - Light-gray, siliceous shale, weathers to platy cherty. Supports locally abundant pine tree growth. Contains clastic sandstone dikes several inches wide and up to tens of feet in length and numerous bentonite layers. Upper portion contains cone-in-cone and dense, siltstone concretions. The Clay Spur bentonite bed (approximately 3 ft (1 m) thick) marks the top of the formation. Thickness estimated from water well logs is 100 ft (33 m)		
	Skull Creek Shale - Dark-gray shale. Weathers to small, rounded clay masses. Generally grass covered. Affected by landslides in areas of steep slope. Approximate thickness is 200 ft (65 m)		
	Fall River Formation - Variegated, interbedded, very fine- to fine-grained sandstone, shale, and mudstone. Massive lower beds and thinly bedded upper beds contain organic material, lenticular bedding, abundant mica flakes, and pyrite. Upper portion consists of tan to light-brown, fine-grained sandstone with wave rippling. The upper contact is gradational into the Skull Creek Shale. Approximate measured thickness is 150 ft (45 m)		
	Lakota Formation - Orange-tan, light-maroon, and white, fine-grained, quartz sandstone and brown to light-gray mudstone. Basal unit is planar bedded sandstone from 20 - 45 ft (7 - 14 m) thick, locally containing <i>Scolithes</i> sp. burrows. The middle portion contains lensoid sandstones to 100 ft (30 m) thick, enclosed in brown mudstone up to 110 ft (33 m) thick (where sandstone thins). Upper unit consists of light-gray mudstone of the Fuson Shale Member that varies in thickness. Sifted wood is common in the channel sandstones and calcareous are abundant in the mudstone. Approximate thickness is 300 ft (90 m)		
	Morrison Formation - Variegated claystone, siltstone, and sandstone. Present as grass-covered slopes below sandstone ledges of the Lakota Formation. Specimens of the dinosaur <i>Barosaurus</i> sp. have been found in the Blackhawk quadrangle (Marsh, 1890; Szeglet, 1979). Approximate thickness is 35 - 65 ft (10 - 20 m) measured from outcrops to a maximum of 141 ft (43 m) reported from water well logs. Included with the Unkpapa Sandstone in cross sections		
	Unkpapa Sandstone - Buff to white, calcareous, well sorted, extremely friable, quartz sandstone. Locally pale-rose in the upper portion. Generally forms grass-covered slopes. The lower contact is sharp with the Redwater Shale Member of the Sundance Formation. The upper contact is sharply defined with the Morrison Formation. Thickness up to 120 ft (36 m)		
	Sundance Formation - Thickness from water well logs varies from 405 - 445 ft (123 - 135 m)		
	Redwater Shale Member - Tan to light gray-green glauconitic sandstone, siltstone, and shale. Thin-bedded, calcareous, with abundant <i>Pachydictya</i> sp. fossils. The uppermost 10 ft (3 m) forms distinctive ledges of calcareous quartz arenite and <i>Eumecurus</i> sp. fossil hash		
	Lak Shale Member - Light-red, massive, fine-grained sandstone and siltstone		
	Hulet Sandstone Member - White to tan, fine-grained sandstone. Thickness to several feet, locally absent in the central portion of the quadrangle		
	Stockade Beaver Shale Member - Tan to light gray-green glauconitic shale, sandstone, and siltstone. Thin-bedded, calcareous, with abundant <i>Pachydictya</i> sp. fossils		
	Spearfish Formation - Rose to red mudstone and siltstone. Gypsum beds (SPgs) up to 20 ft (6 m) thick occur near the middle and near the top; veins of gypsum occur throughout. Forms low, grass-covered slopes. Thickness reported from water well logs varies from 402 - 497 ft (122 - 151 m)		
	Minnekahta Limestone - Pale-lavender, beige, to light-gray limestone. Thin-bedded; contains abundant stylonites, kink bands, and box folds. Forms dip slopes that are commonly tree covered. Thickness 43 - 80 ft (13 - 18 m). Included with the Opache Shale in cross sections		
	Opache Shale - Red to maroon mudstone and siltstone. Lavender coloring in uppermost 8 ft (1.5 m). Exposed on slopes beneath the Minnekahta Limestone. Approximate thicknesses reported from water well logs from 48 - 162 ft (15 - 49 m), averaging 110 ft (33 m) thick		
	Minnelusa Formation - Beige, white, and gray sandstone, shale, limestone, and dolomite. Lower portion is medium- to thick-bedded dolomite, sandstone, shale, and limestone. Upper portion is dominated by thick-bedded to massive sandstone, strongly deformed by solution of interbedded evaporites. Well exposed in canyon walls with few outcrops in uplands. Approximate thickness reported from water well logs varies from 450 - 550 ft (136 - 167 m)		
	Pahasapa Limestone - Light-gray, cream, and tan limestone and dolomite. Massive outcrops in canyon walls weather to dark-gray. The upper portion is strongly brecciated and locally has a rose-colored matrix. The contact with the Minnelusa Formation is an irregular erosional surface. Approximate thickness 400 - 450 ft (121 - 136 m). Includes the Devonian-Mississippian Englewood Limestone (MDe) on cross sections; thickness derived from water well logs		
	Deadwood Formation - Shown only in cross section; thickness of approximately 225 ft (69 m) derived from water well logs		
	Undifferentiated Precambrian rocks - Shown only in cross section		

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Acknowledgements

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