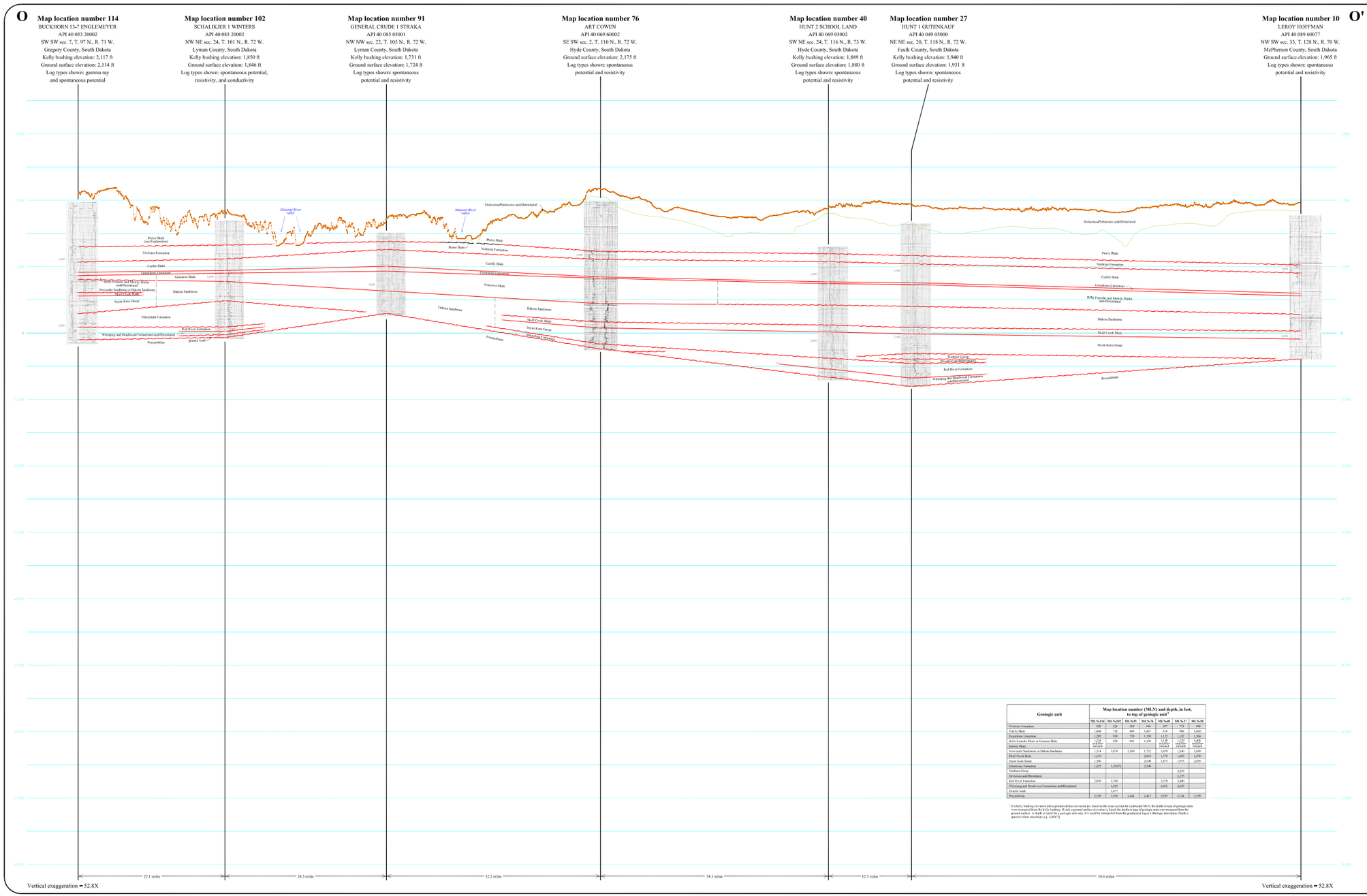


Geologic unit	Map location number (MLN) and depth, in feet, to top of geologic unit[1]						
	MLN-114	MLN-102	MLN-91	MLN-76	MLN-40	MLN-27	MLN-10
Niobrara Formation	820	524	948	944	697	775	948
Carlile Shale	1,040	774	450	1,007	918	968	1,000
Greenhorn Limestone	1,205	910	730	1,330	1,122	1,182	1,304
Belle Fourche Shale or Graneros Shale	1,278 and 1,290	998	869	1,350	1,150 and 1,162	1,222 and 1,234	1,420 and 1,432
Mowry Shale					1,240	1,252	1,442
Newcastle Sandstone or Dakota Sandstone	1,314	1,074	1,110	1,732	1,470	1,540	1,680
Skull Creek Shale	1,510			2,010	1,770	1,860	1,950
Inyan Kara Group	1,580			2,110	1,875	1,935	2,010
Minnelusa Formation	1,925	1,593[2]		2,545			
Madison Group						2,250	
Devonian undifferentiated						2,335	
Red River Formation	2,030	1,760			2,270	2,400	
Winnipeg and Deadwood Formations undifferentiated		1,829			2,452	2,620	
Granite wash		1,877					
Precambrian	2,220	1,910	1,444	2,415	2,555	2,748	2,550

[1] If a kelly bushing elevation and a ground surface elevation are listed on the cross section for a particular MLN, the depths to tops of geologic units were measured from the kelly bushing. If only a ground surface elevation is listed, the depths to tops of geologic units were measured from the ground surface. A depth is listed for a geologic unit only if it could be interpreted from the geophysical log or a lithologic description. Depth is queried where uncertain (e.g. 1,265?).

[2] Depth is queried because of a possible change in lithology.

STATE OF SOUTH DAKOTA
M. Michael Rounds, Governor

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
Steven M. Pirner, Secretary

DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
David Templeton, Director

GEOLOGICAL SURVEY
Derrie L. Iles, State Geologist

OIL AND GAS INVESTIGATION 2

Cross Sections Showing Geophysical Logs of Phanerozoic Rocks in South Dakota

Plate 15. Structural Cross Section O-O'

J.E. FOX, K.A. MCCORMICK, AND T.N. HAGGAR

2009

Prepared in cooperation with the Department of Geology and Geological Engineering, South Dakota School of Mines and Technology

Explanation

The youngest geologic contact interpreted in areas west of the Missouri River is the contact between the Niobrara Formation and the Pierre Shale. It is recognized that younger geologic units often exist above the Pierre Shale, but they were not interpreted for this cross section.

- Correlation line at a conformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain
- Correlation line at an unconformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain
- Correlation line at an unconformable geologic contact. Interpreted from Tomhave and Schulz (2004)
- Profile of land surface derived from U.S. Geological Survey digital elevation models
- Profile of the bedrock surface east of the Missouri River. Queried where uncertain. Due to the scale of the cross section, bedrock outcrop areas are not shown. Modified from Tomhave and Schulz (2004)
- Boundary of nomenclature change. Boundary shown in orange on index map below. Boundary and nomenclature generally coincide with Fahrenbach and others (2007)

Correlation lines are not intended to show detailed structure or actual elevation of a geologic unit between data points. Correlation lines are not projected to land surface near the Black Hills even though some geologic units crop out. The generalized nature of the cross section does not lend itself to illustration of these outcrop areas.

Depth of well, in feet, below kelly bushing or ground surface

Mean Sea level elevation in feet

Marker for a geologic contact

Datum for cross section is mean sea level

Horizontal and vertical scales of cross section

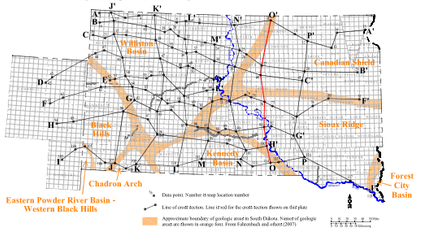
400 feet

0

0 4 miles

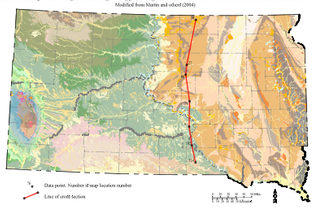
Vertical exaggeration = 52.8X

Index map showing locations of data points used for construction of cross sections



Index map showing surface geology along the line of cross section in South Dakota

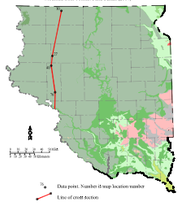
Modified from Martin and others (2004)



Index map showing bedrock geology along the line of cross section east of the Missouri River

Modified from Tomhave and Schulz (2004)

Map location number	Surface geologic unit	Bedrock geologic unit east of the Missouri River
114	Pierre Shale	
102	Pierre Shale	
91	Pierre Shale	
76	Tdl, glacial erratics	Pierre Shale
40	Tdl, glacial erratics	Pierre Shale
27	Tdl, glacial erratics	Pierre Shale
10	Ocwsgb, collapsed	Pierre Shale



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Fahrenbach, M.D., Souza, F.V., Sawyer, J.F., McCormick, K.A., McGillivray, G.L., Schulz, L.D., and Redden, J.A., 2007, *South Dakota stratigraphic correlation chart*: South Dakota Geological Survey Oil and Gas Investigation 1.

Martin, J.E., Sawyer, J.F., Fahrenbach, M.D., Tomhave, D.W., and Schulz, L.D., 2004, *Geologic map of South Dakota*: South Dakota Geological Survey General Map 10, 4ed. 1:500,000.

Tomhave, D.W., and Schulz, L.D., 2004, *Bedrock geologic map showing configuration of the bedrock surface in South Dakota east of the Missouri River*: South Dakota Geological Survey General Map 9, 4ed. 1:500,000.