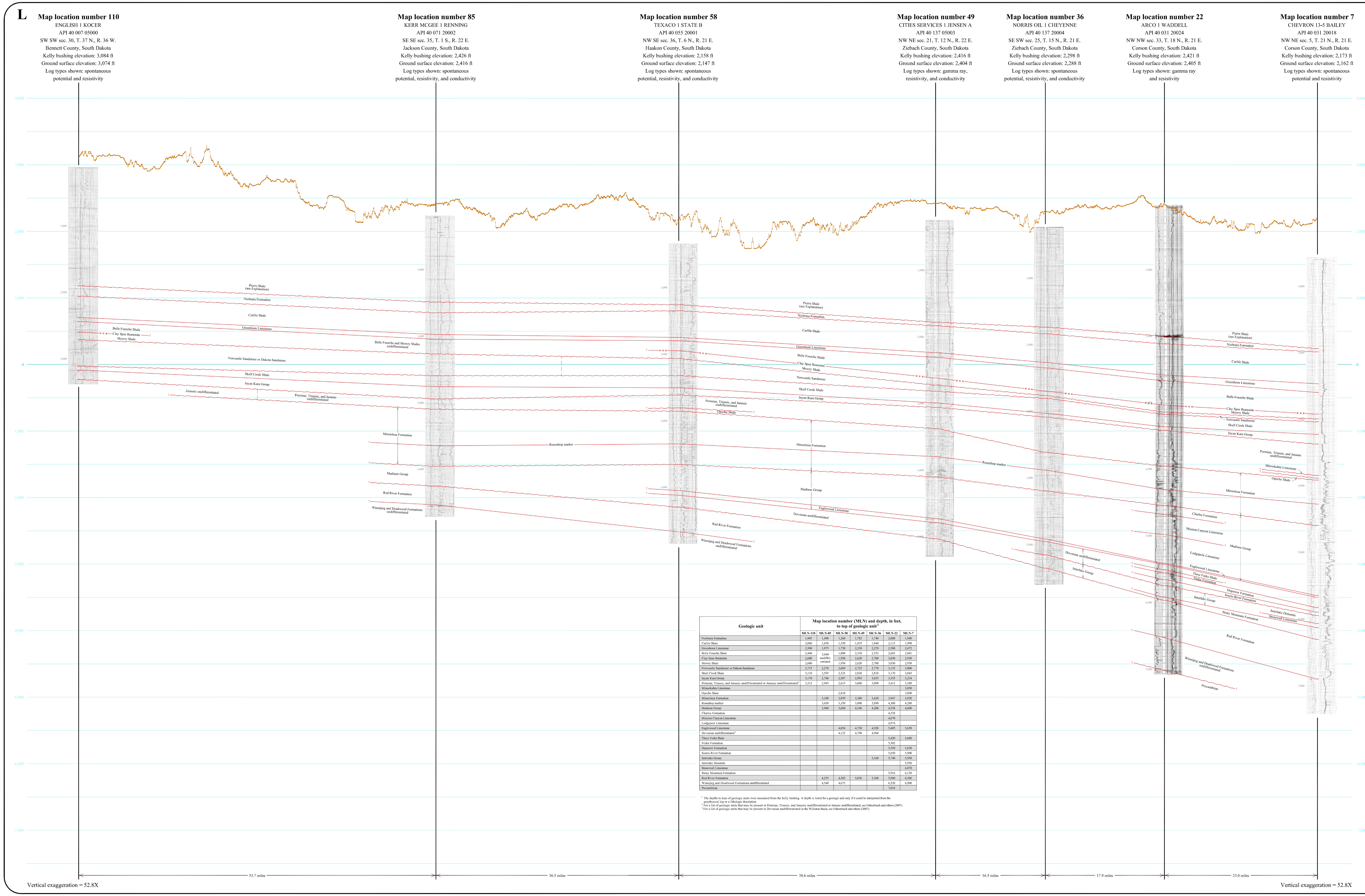
L

L'



Geologic unit	Map location number (MLN) and depth, in feet, to top of geologic unit[1]						
	MLN-110	MLN-85	MLN-58	MLN-49	MLN-36	MLN-22	MLN-7
Niobrara Formation	1,905	1,490	1,260	1,782	1,740	2,000	1,940
Carlile Shale	2,060	1,650	1,350	1,835	1,840	2,115	1,990
Greenhorn Limestone	2,380	1,975	1,750	2,238	2,270	2,580	2,472
Belle Fourche Shale	2,440	2,048 undiffer-entiated	1,800	2,310	2,352	2,665	2,601
Clay Spur Bentonite	2,600		1,950	2,620	2,700	3,030	2,930
Mowry Shale	2,600		1,950	2,620	2,700	3,030	2,930
Newcastle Sandstone or Dakota Sandstone	2,715	2,270	2,069	2,725	2,770	3,135	3,000
Skull Creek Shale	3,110	2,595	2,325	2,820	2,810	3,170	3,045
Inyan Kara Group	3,170	2,760	2,507	2,993	3,035	3,355	3,234
Permian, Triassic, and Jurassic undifferentiated or Jurassic undifferentiated[2]	3,312	2,945	2,615	3,060	3,090	3,412	3,380
Minnekahta Limestone							3,850
Opeche Shale			2,810				3,890
Minnelusa Formation		3,100	2,859	3,380	3,620	3,947	3,920
Roundtop marker		3,650	3,350	3,800	3,890	4,300	4,280
Madison Group		3,960	3,660	4,106	4,200	4,538	4,600
Charles Formation						4,538	
Mission Canyon Limestone						4,670	
Lodgepole Limestone						4,974	
Englewood Limestone			4,054	4,730	4,920	5,405	5,650
Devonian undifferentiated[3]			4,125	4,790	4,960		
Three Forks Shale						5,420	5,680
Nisku Formation						5,502	
Duperow Formation						5,550	5,830
Souris River Formation						5,650	5,900
Interlake Group					5,160	5,740	5,950
Interlake Dolomite							5,950
Stonewall Limestone							6,070
Stony Mountain Formation						5,916	6,130
Red River Formation		4,255	4,302	5,036	5,360	5,960	6,306
Winnipeg and Deadwood Formations undifferentiated		4,540	4,675			6,520	6,900
Precambrian						7,018	

[1] The depths to tops of geologic units were measured from the kelly bushing. A depth is listed for a geologic unit only if it could be interpreted from the geophysical log or a lithologic description.
[2] For a list of geologic units that may be present in Permian, Triassic, and Jurassic undifferentiated or Jurassic undifferentiated, see Fahrenbach and others (2007).
[3] For a list of geologic units that may be present in Devonian undifferentiated in the Williston Basin, see Fahrenbach and others (2007).

STATE OF SOUTH DAKOTA
M. Michael Rounds, Governor

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Steven M. Pirner, Secretary

DIVISION OF FINANCIAL AND TECHNICAL ASSISTANCE
David Templeton, Director

GEOLOGICAL SURVEY
Derric L. Iles, State Geologist

OIL AND GAS INVESTIGATION 2

Cross Sections Showing Geophysical Logs of Phanerozoic Rocks in South Dakota

Plate 12. Structural Cross Section L-L'

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

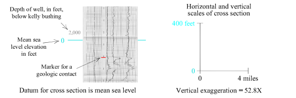
Explanation

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.

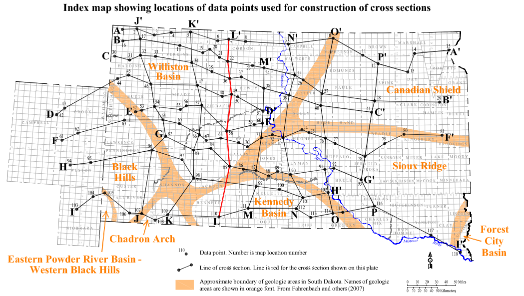
- Correlation line at a conformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain
- Correlation line at an unconformable geologic contact. Interpreted from a geophysical log or lithologic description. Queried where uncertain

Correlation 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.

- Profile of land surface derived from U.S. Geological Survey digital elevation models
- Bentonite bed
- Boundary of nomenclature change. Boundary shown in orange on index map below. Boundary and nomenclature generally coincide with Fahrenbach and others (2007)

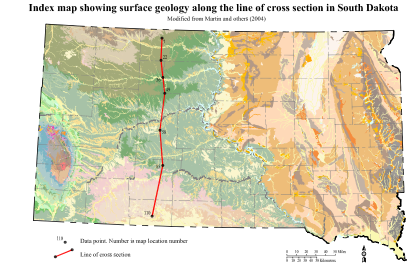


Index map showing locations of data points used for construction of cross sections



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

Modified from Martin and others (2004)



Map location number	Surface geologic unit
110	Arikaree Group
85	Terrace deposits
58	Terrace deposits
49	Fox Hills Formation
36	Fox Hills Formation
22	Hell Creek Formation
7	Hell Creek Formation

References

Fahrenbach, M.D., Steece, 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, scale 1:500,000.