

## **APPENDIX B**

### **Index map and geologic cross sections in Lincoln and Union Counties, South Dakota**

Index map of Lincoln and Union Counties showing locations of stratigraphic cross sections and test holes

Legend for the geologic cross sections

West to east geologic cross-sections in Lincoln and Union Counties, South Dakota

#### **LINCOLN COUNTY**

A-A'  
B-B'  
C-C'  
D-D'  
E-E'  
F-F'  
G-G'  
H-H'  
I-I'

#### **UNION COUNTY**

J-J'  
K-K'  
L-L'  
M-M'  
N-N'  
O-O'  
P-P'  
Q-Q'  
R-R'

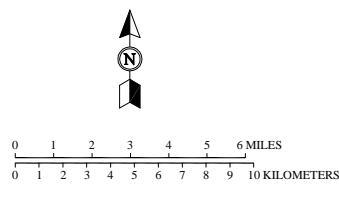
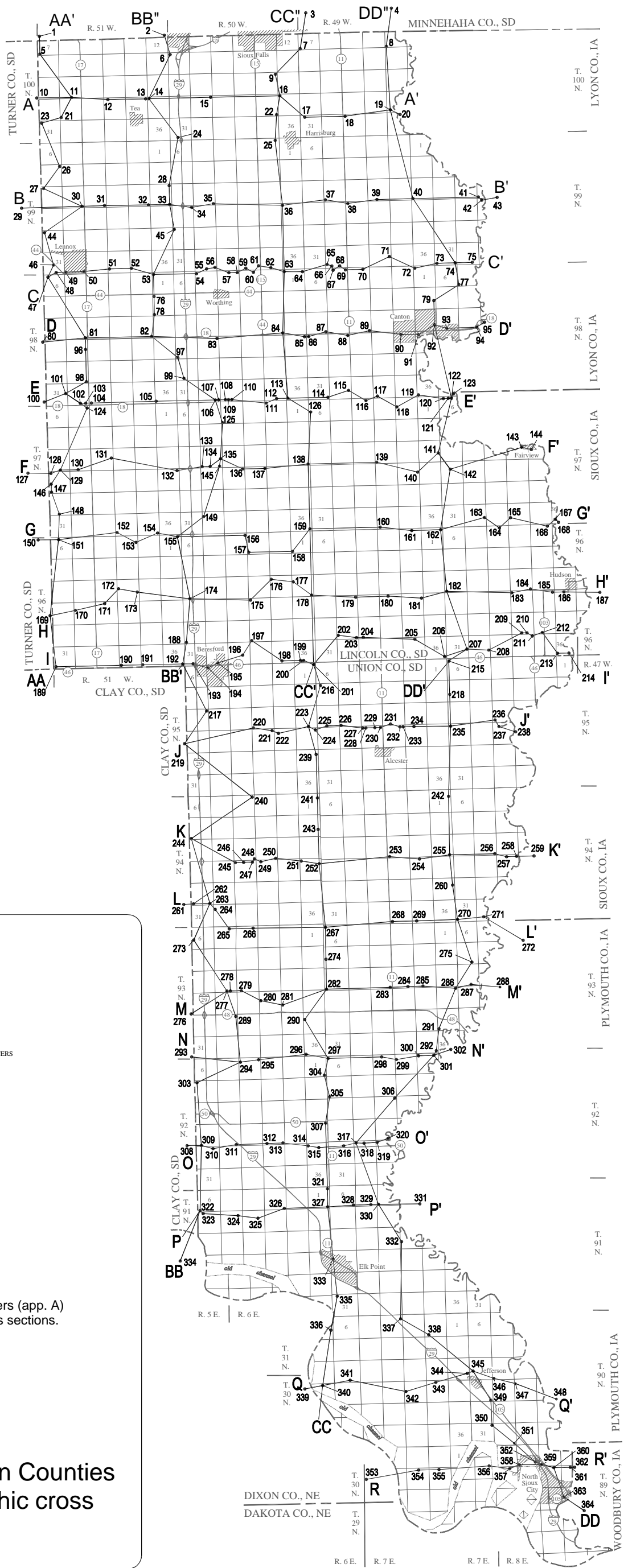
South to north geologic cross-sections in Lincoln and Union Counties, South Dakota

#### **LINCOLN COUNTY**

AA-AA'  
BB'-BB''  
CC'-CC''  
DD'-DD''

#### **UNION COUNTY**

BB-BB'  
CC-CC'  
DD-DD'






- 10. Test hole.
- A A' Line of cross section.

Numbers refer to map location numbers (app. A) of test holes on the stratigraphic cross sections.

Index map of Lincoln and Union Counties showing locations of stratigraphic cross sections and test holes.

# Legend for the geologic cross sections.

Quaternary	Qal	Holocene alluvium
	Ql	late Wisconsin to Holocene loess, undifferentiated
	Qll	Quaternary lacustrine sediments
	Qwloa	late Wisconsin outwash and/or Holocene alluvium, undifferentiated
	Qwlo	late Wisconsin outwash
	Qwill	late Wisconsin lacustrine sediments
	Qwlt(ox)	late Wisconsin till (oxidized)
	Qwlt	late Wisconsin till
	Qos	late Wisconsin or pre-Illinoian outwash, sand
	Qo	late Wisconsin or pre-Illinoian outwash, undifferentiated
	Qpwill(?)	pre-late Wisconsin lacustrine sediments, undifferentiated; interpretation uncertain
	Qpwill	pre-late Wisconsin loess, undifferentiated
	Qpwlps	pre-late Wisconsin paleosol
	Qpio	pre-Illinoian outwash, undifferentiated; (?) indicates uncertainty
	Qpil	pre-Illinoian loess, undifferentiated; (?) indicates uncertainty
	Qpill	pre-Illinoian lacustrine sediments, undifferentiated
	Qpids(?)	pre-illinoian dune sand; interpretation uncertain
	Qpit(ox)	pre-Illinoian till (oxidized), undifferentiated
	Qpit	pre-Illinoian till, undifferentiated; (?) indicates uncertainty
	Qpi <sub>3</sub> t(ox)	pre-Illinoian 3 till (oxidized)
	Qpi <sub>3</sub> t	pre-Illinoian 3 till; (?) indicates uncertainty
	Qpi <sub>3</sub> o	pre-Illinoian 3 outwash
	Qpi <sub>3</sub> ll	pre-Illinoian 3 lacustrine sediments
	Qpi <sub>2</sub> t(ox)	pre-Illinoian 2 till (oxidized)
	Qpi <sub>2</sub> t	pre-Illinoian 2 till; (?) indicates uncertainty
	Qpi <sub>2</sub> o	pre-Illinoian 2 outwash
	Qpi <sub>2</sub> ll	pre-Illinoian 2 lacustrine sediments
	Qpi <sub>1</sub> t(ox)	pre-Illinoian 1 till (oxidized)
	Qpi <sub>1</sub> t	pre-Illinoian 1 till; (?) indicates uncertainty
	Qpi <sub>1</sub> o	pre-Illinoian 1 outwash
	Qpi <sub>1</sub> ll	pre-Illinoian 1 lacustrine sediments
	Qpi <sub>1</sub> l	pre-Illinoian 1 loess
Qpi <sub>0</sub> t	pre-Illinoian 0? till	
Qpips	pre-Illinoian paleosol; (?) indicates uncertainty	
Qpis	pre-Illinoian nonglacial (?) quartz sand and gravel (Newton Hills sand, western-derived sand, Alcester quartz sand); (?) indicates uncertainty	

Cretaceous	Kn	Niobrara Formation
	Kc	Carlile Shale, undifferentiated
	Kcbh	Carlile Shale, Blue Hill Shale Member
	Kcfp	Carlile Shale, Fairport Shale Member; (?) indicates uncertainty
	Kg	Greenhorn Limestone
	Kgr	Graneros Shale
	Kd	Dakota Formation, undifferentiated
	Kd <sub>ss</sub>	Dakota Formation, sandstone
	Kd <sub>slst</sub>	Dakota Formation, siltstone
	Kd <sub>sh</sub>	Dakota Formation, shale
	Kd <sub>ss-sh</sub>	Dakota Formation, interbedded sandstone and shale
	Kd <sub>co</sub>	Dakota Formation, coal bed
	Kd <sub>qs</sub>	Dakota Formation, quartzite-derived sand
	Ku	Cretaceous undifferentiated rocks
	Ku <sub>ss</sub>	Cretaceous undifferentiated sandstone
	Ku <sub>sh</sub>	Cretaceous undifferentiated shale
Ku <sub>ss-sh</sub>	Cretaceous undifferentiated sandstone and shale	
Paleozoic	Pzu	Paleozoic rocks, undifferentiated; (?) indicates uncertainty
	Pzu <sub>ss</sub>	Paleozoic sandstone, undifferentiated; (?) indicates uncertainty
	D(?) <sub>ds</sub>	Dolostone of probable Devonian age
	Og	Ordovician Galena Group dolostone and limestone; (?) indicates uncertainty
	Ogd	Ordovician Galena Group, Decorah Shale
	Ostp	Ordovician Saint Peter Sandstone
	Ed	Cambrian Davis Formation
	Cw	Cambrian Wonwoc Sandstone
	Cbt	Cambrian Bonnetterre Formation
	Cms	Cambrian Mt. Simon Sandstone
Cu <sub>ss</sub>	Cambrian rocks, undifferentiated sandstone	
Precambrian	pCs	Sioux Quartzite
	pCs <sub>w</sub>	Sioux Quartzite, weathered to regolith
	pCsg	Spink Gabbro
	pCg	Unnamed granite
	pCim	Igneous and metamorphic rocks, undifferentiated
		Measured section - Surface exposure
		Test hole
		Lithologic contact. Dashed where approximate, question mark where uncertain.



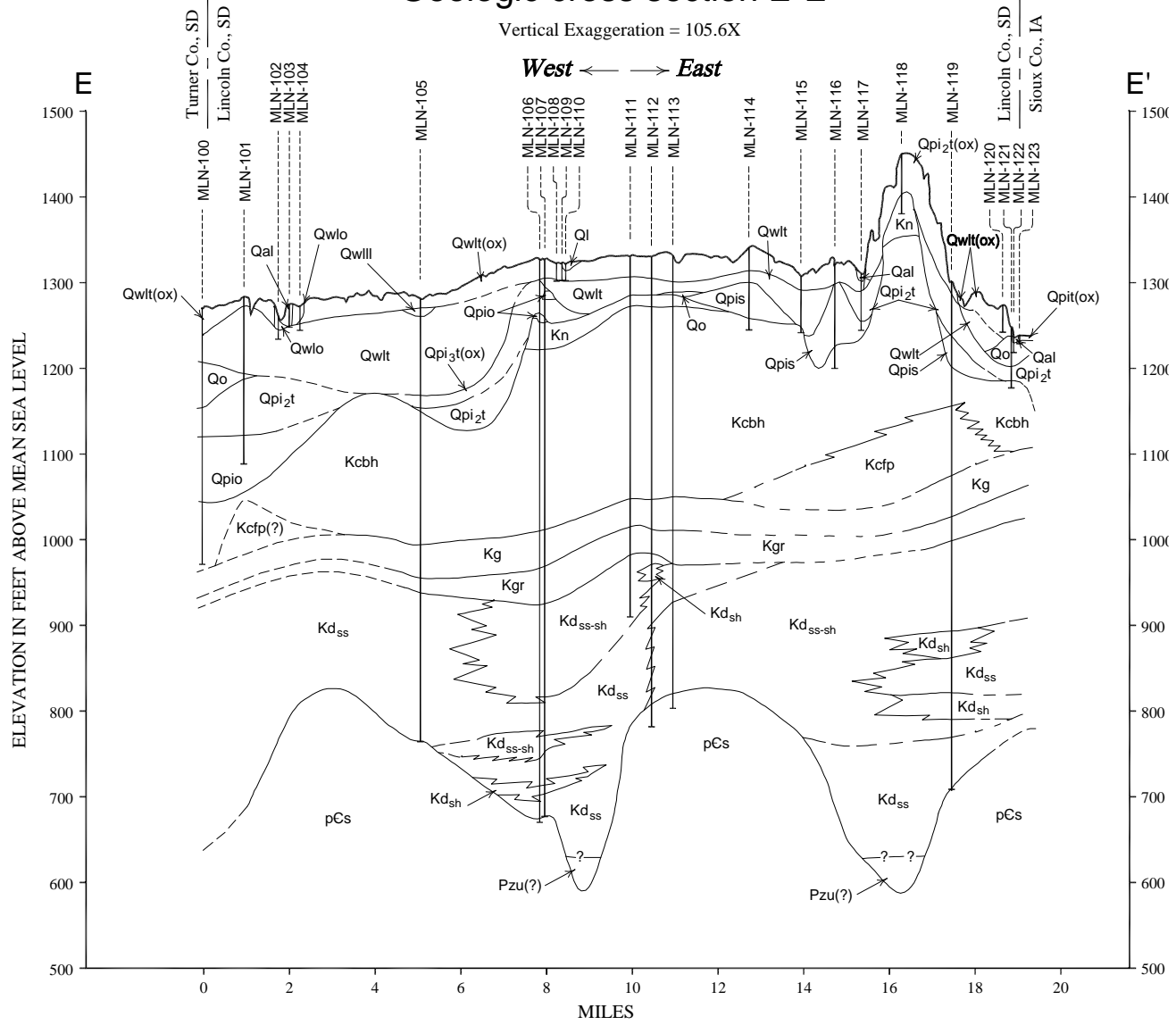






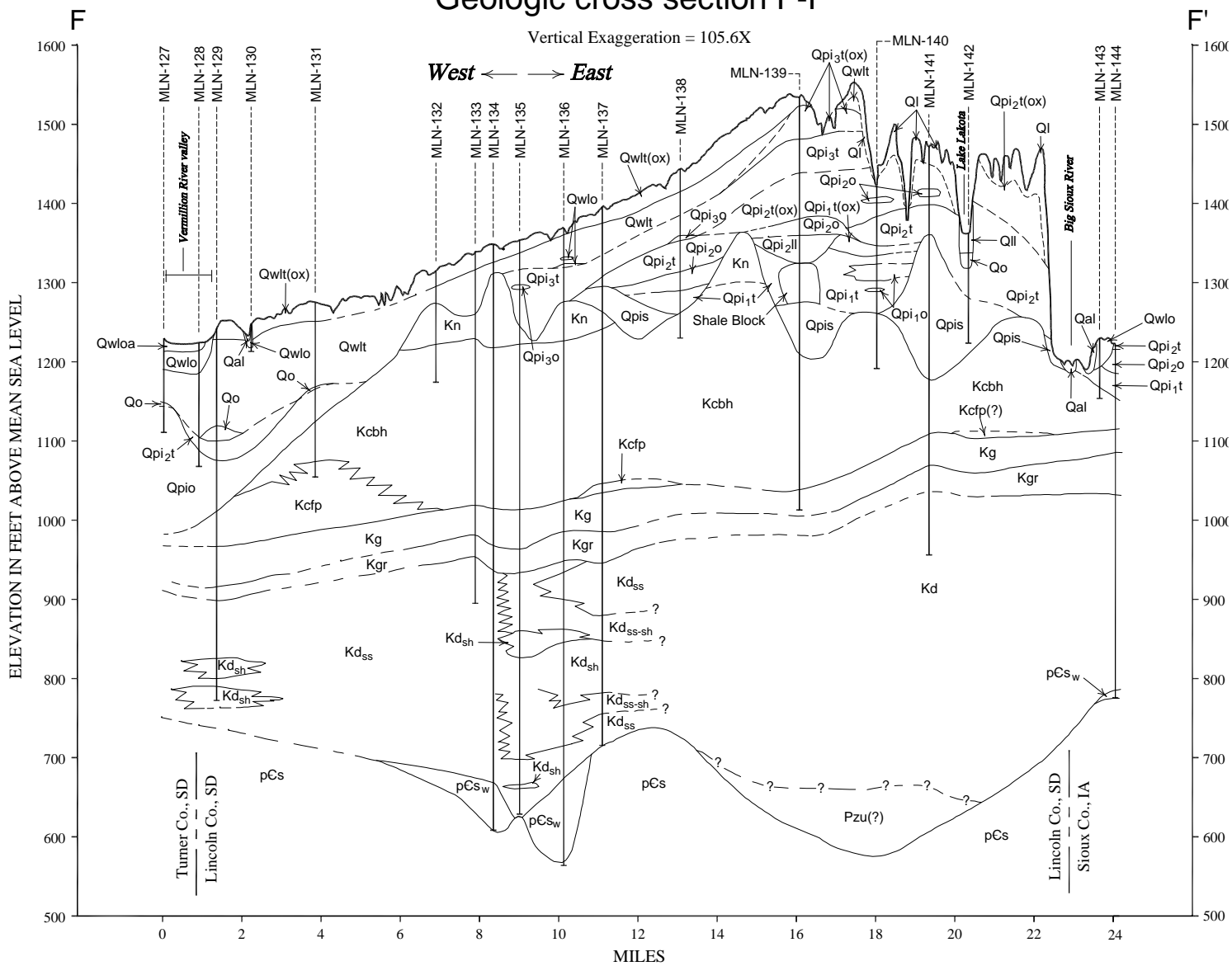
# Geologic cross section E-E'

Vertical Exaggeration = 105.6X





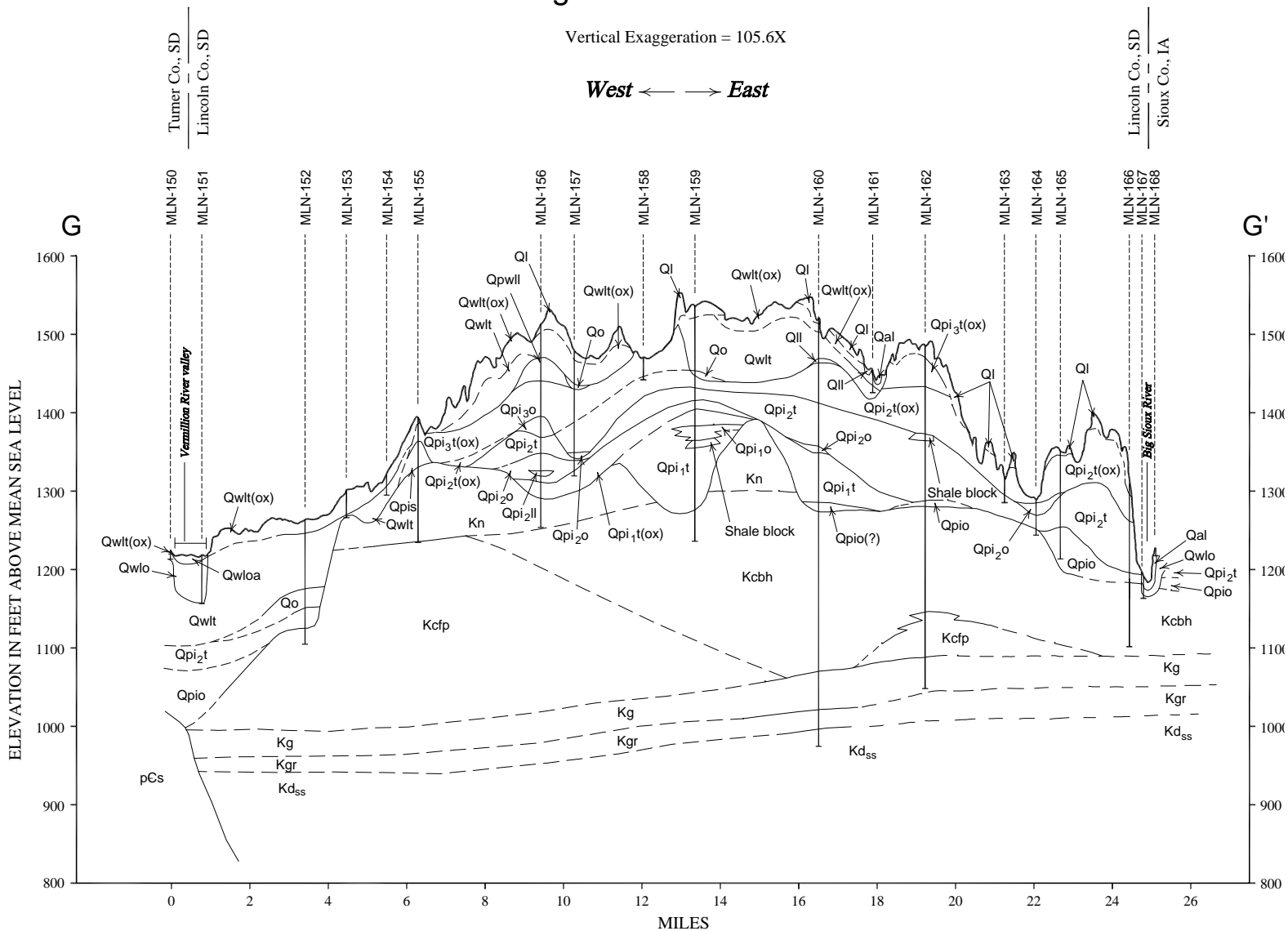
# Geologic cross section F-F'



# Geologic cross section G-G'

Vertical Exaggeration = 105.6X

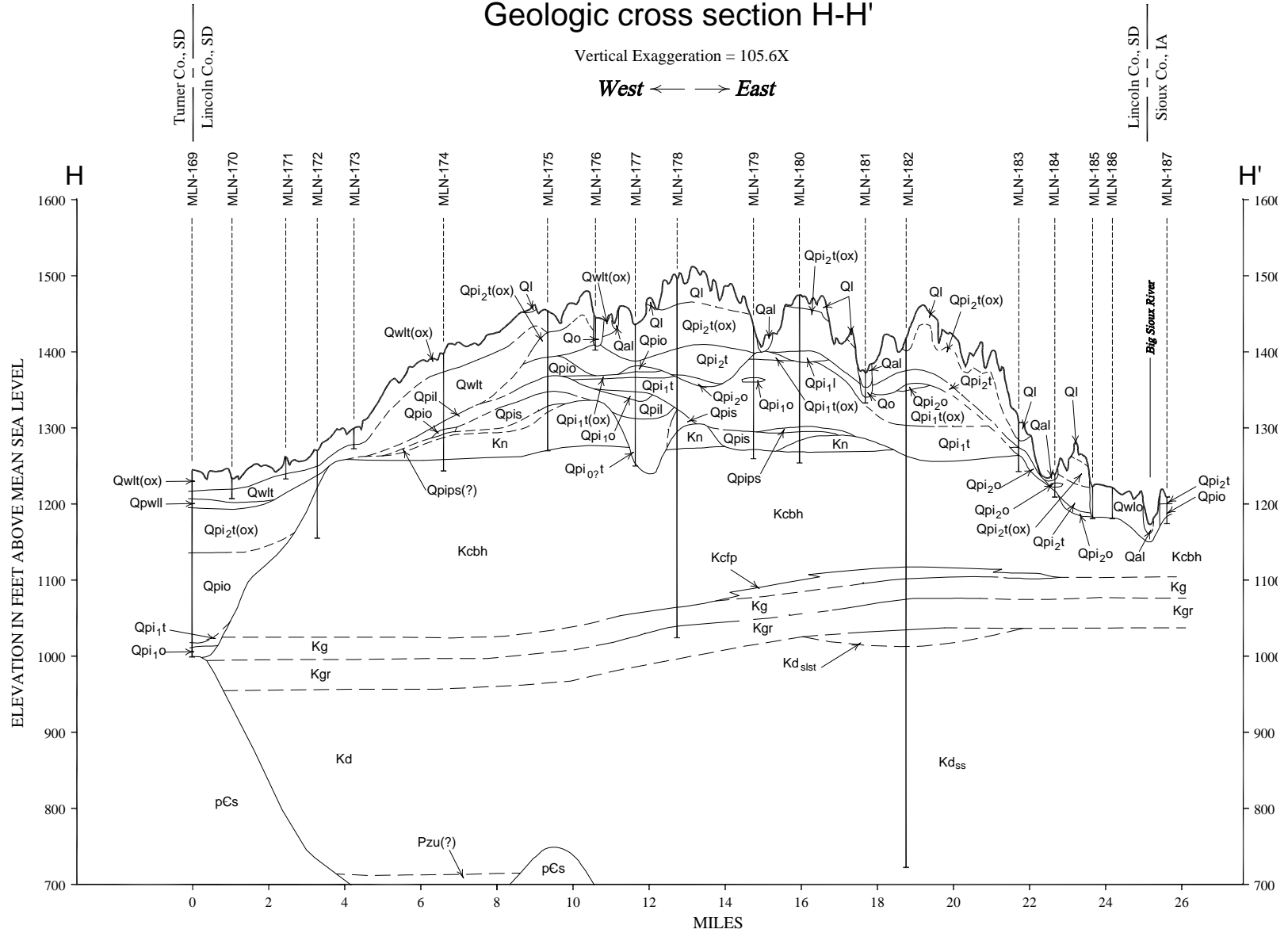
West ← → East



# Geologic cross section H-H'

Vertical Exaggeration = 105.6X

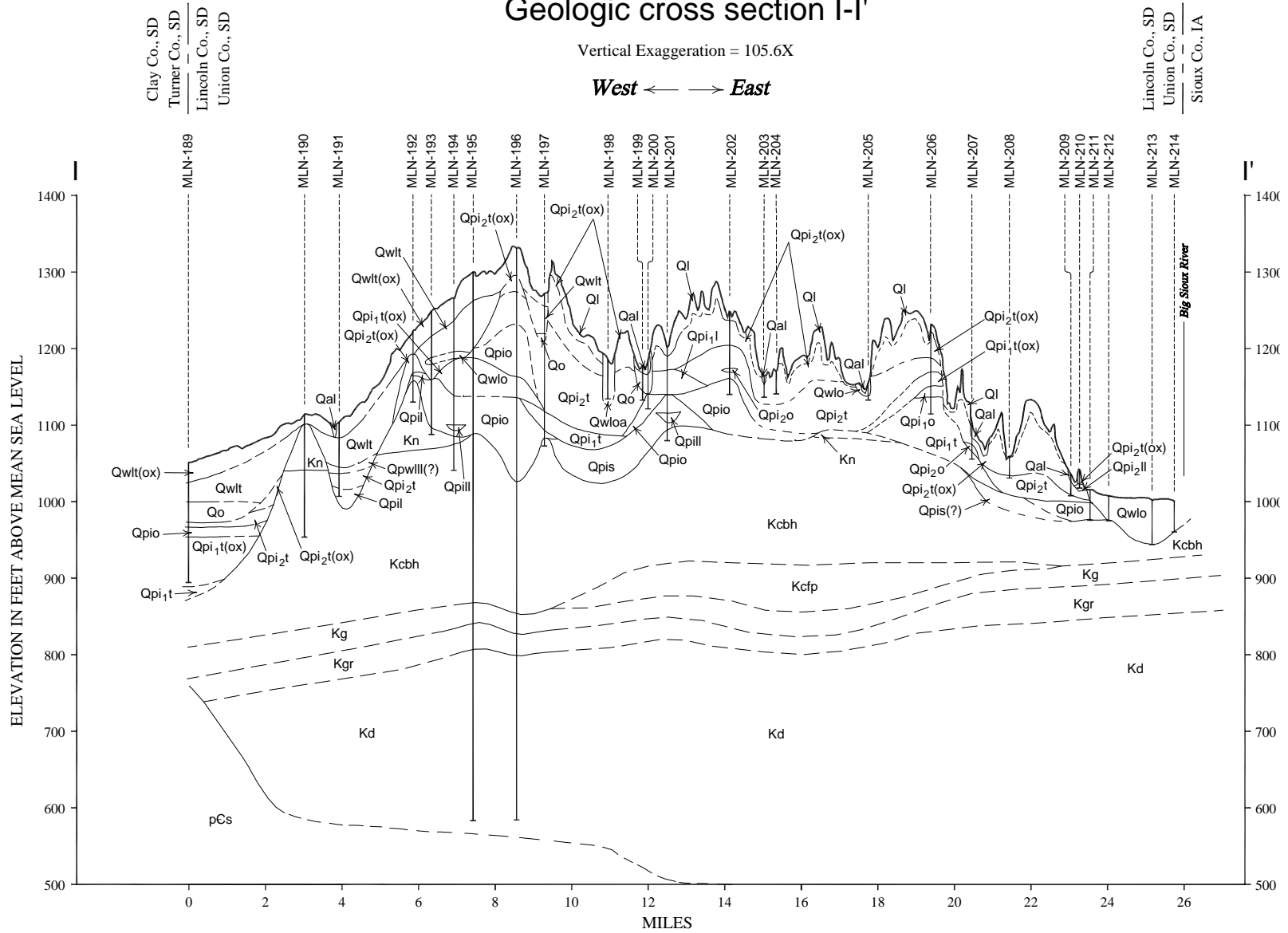
West ← → East



# Geologic cross section I-I'

Vertical Exaggeration = 105.6X

West ← → East



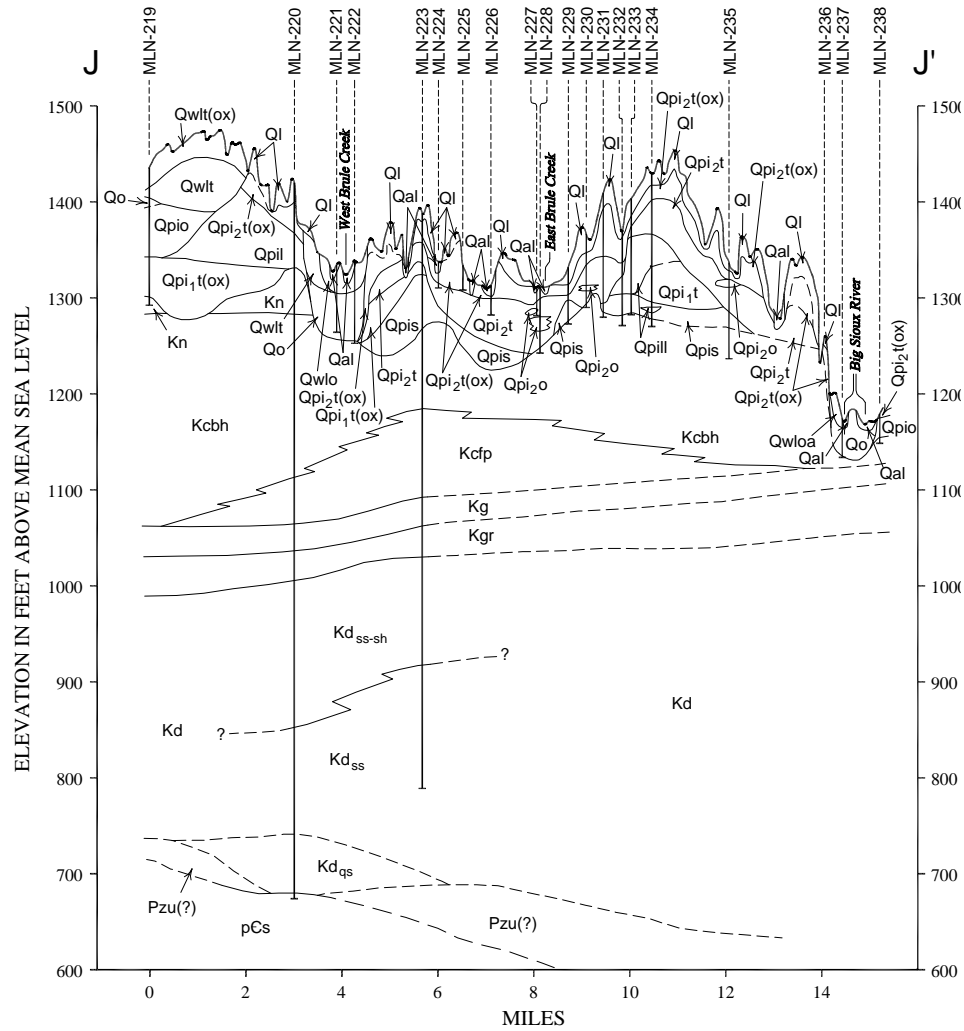
# Geologic cross section J-J'

Vertical Exaggeration = 105.6X

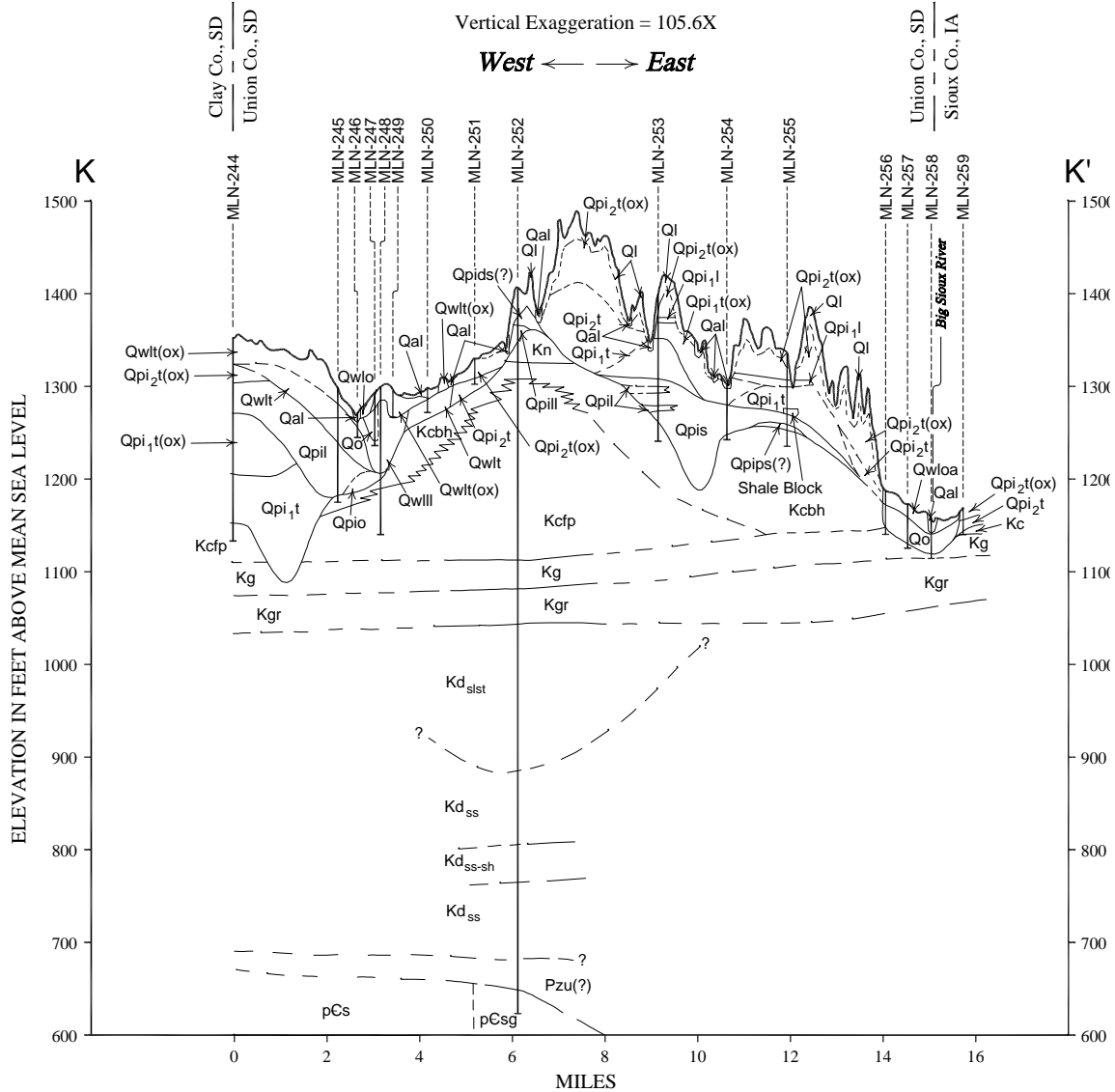
West ← → East

Clay Co., SD  
Union Co., SD

Union Co., SD  
Sioux Co., IA



# Geologic cross section K-K'



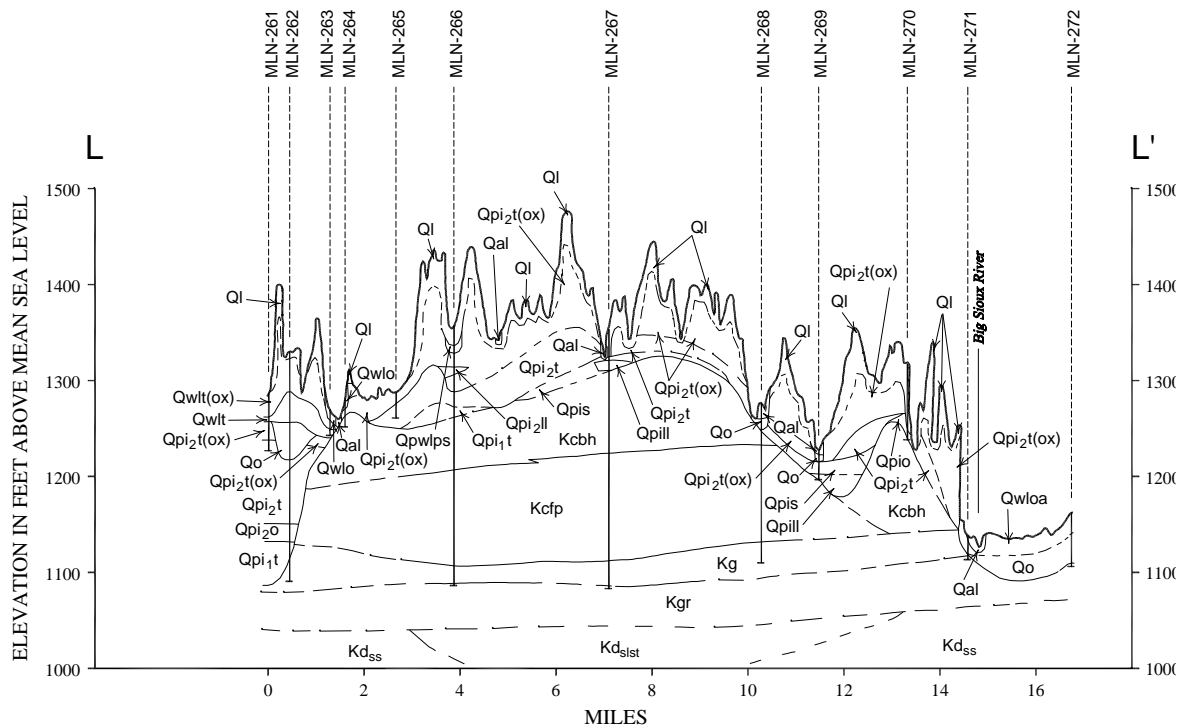
# Geologic cross section L-L'

Vertical Exaggeration = 105.6X

West ← → East

Clay Co., SD  
Union Co., SD

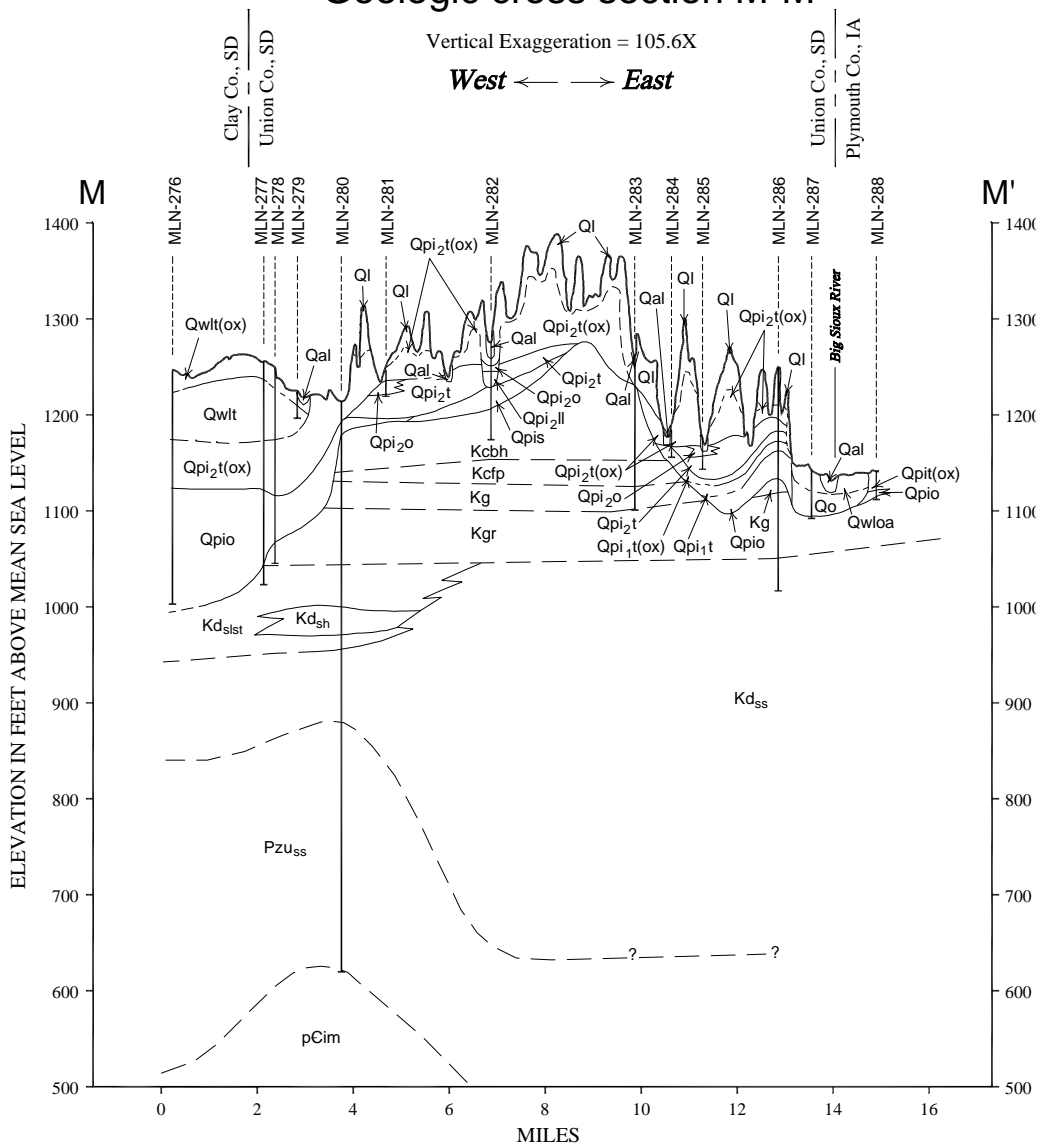
Union Co., SD  
Plymouth Co., IA



# Geologic cross section M-M'

Vertical Exaggeration = 105.6X

**West** ← → **East**

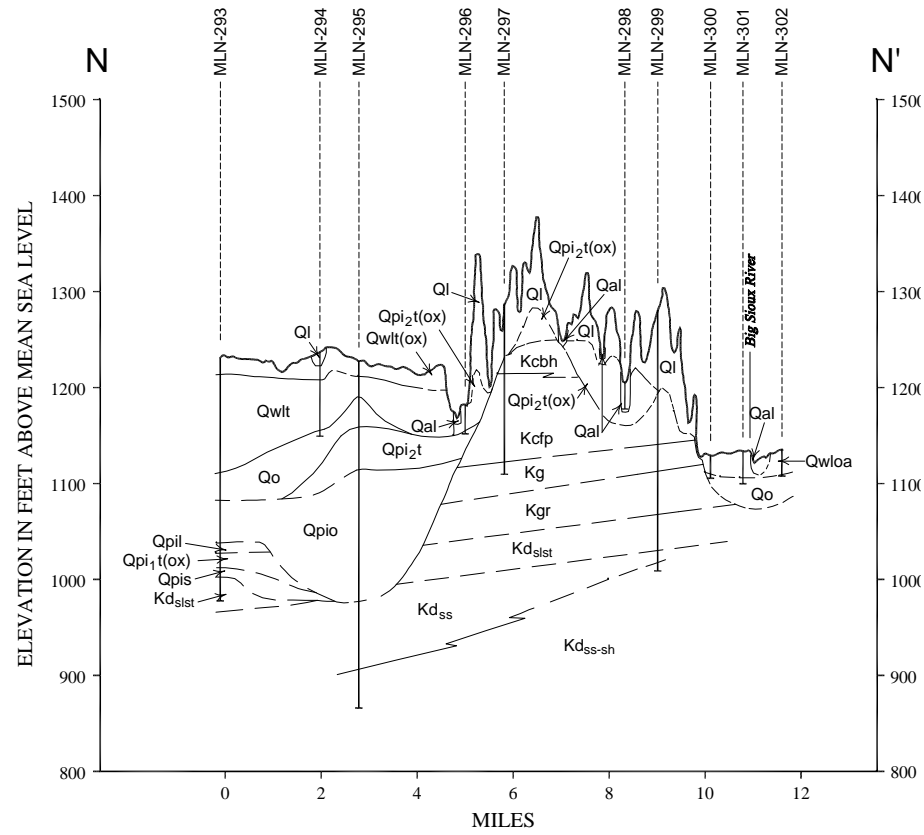




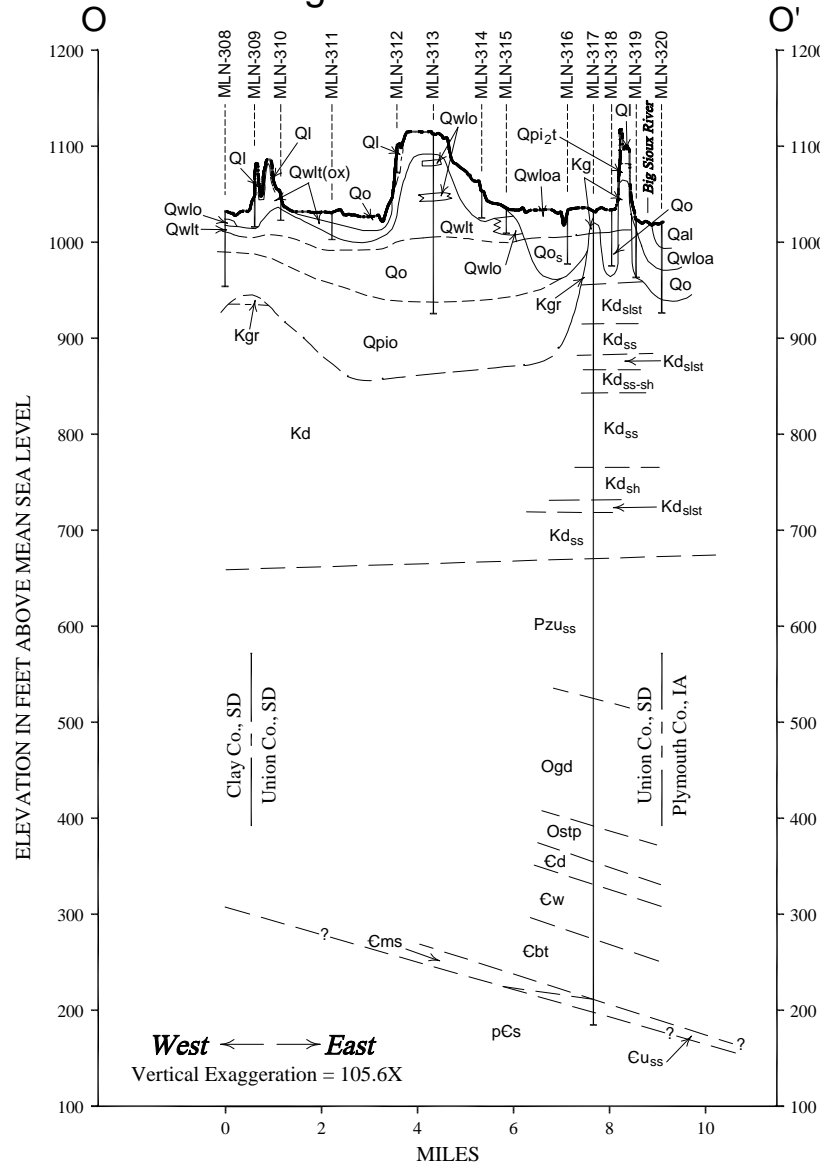
# Geologic cross section N-N'

Vertical Exaggeration = 105.6X

Clay Co., SD  
Union Co., SD  
*West* ← → *East*  
Union Co., SD  
Plymouth Co., IA



# Geologic cross section O-O'

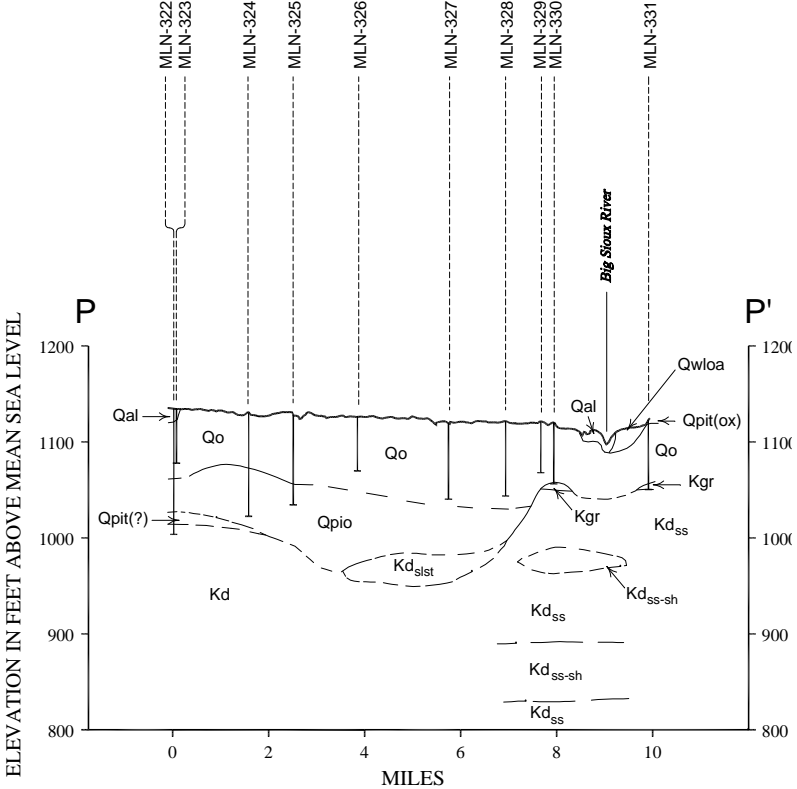


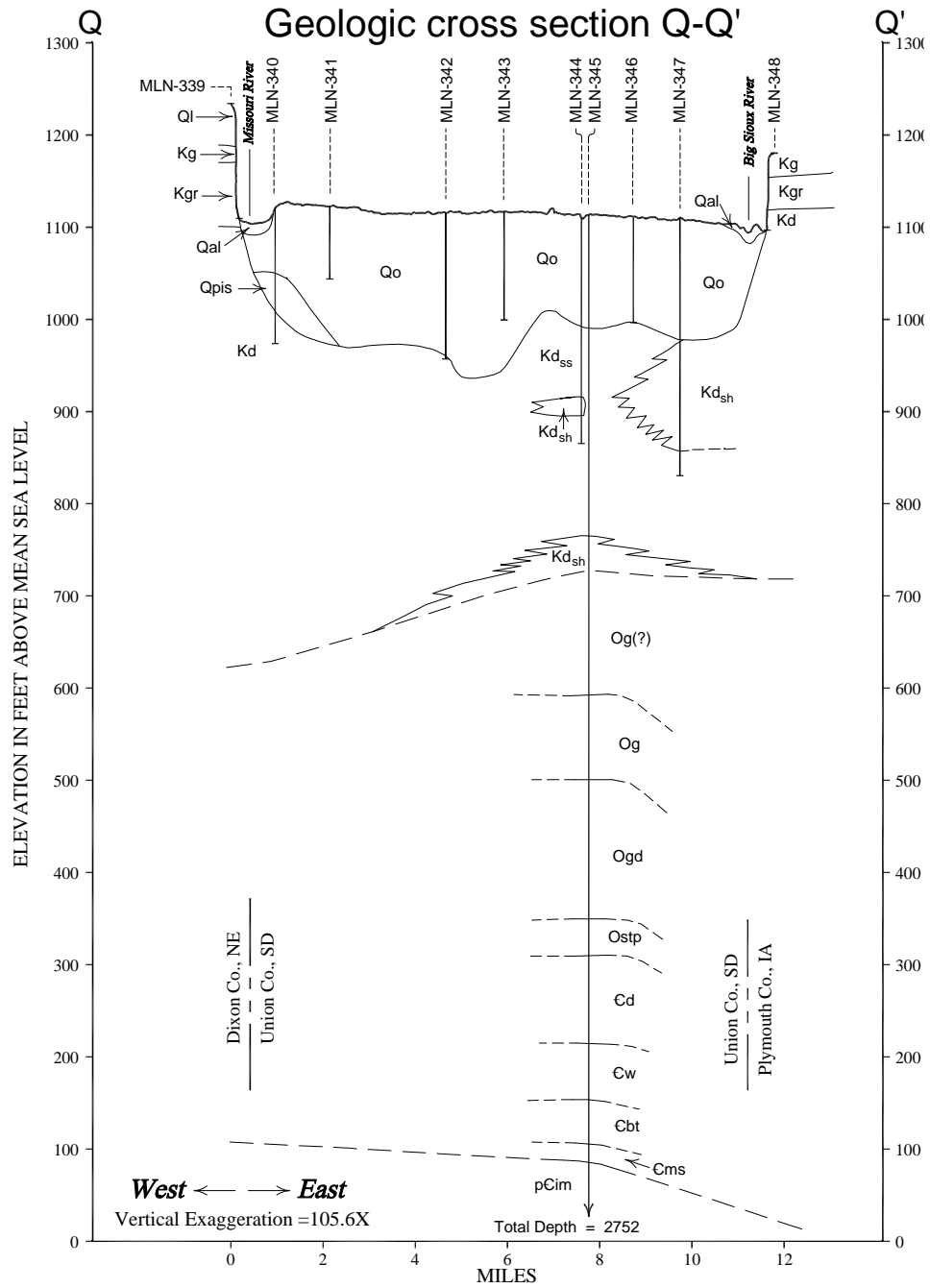
# Geologic cross section P-P'

Vertical Exaggeration = 105.6X

West ← → East

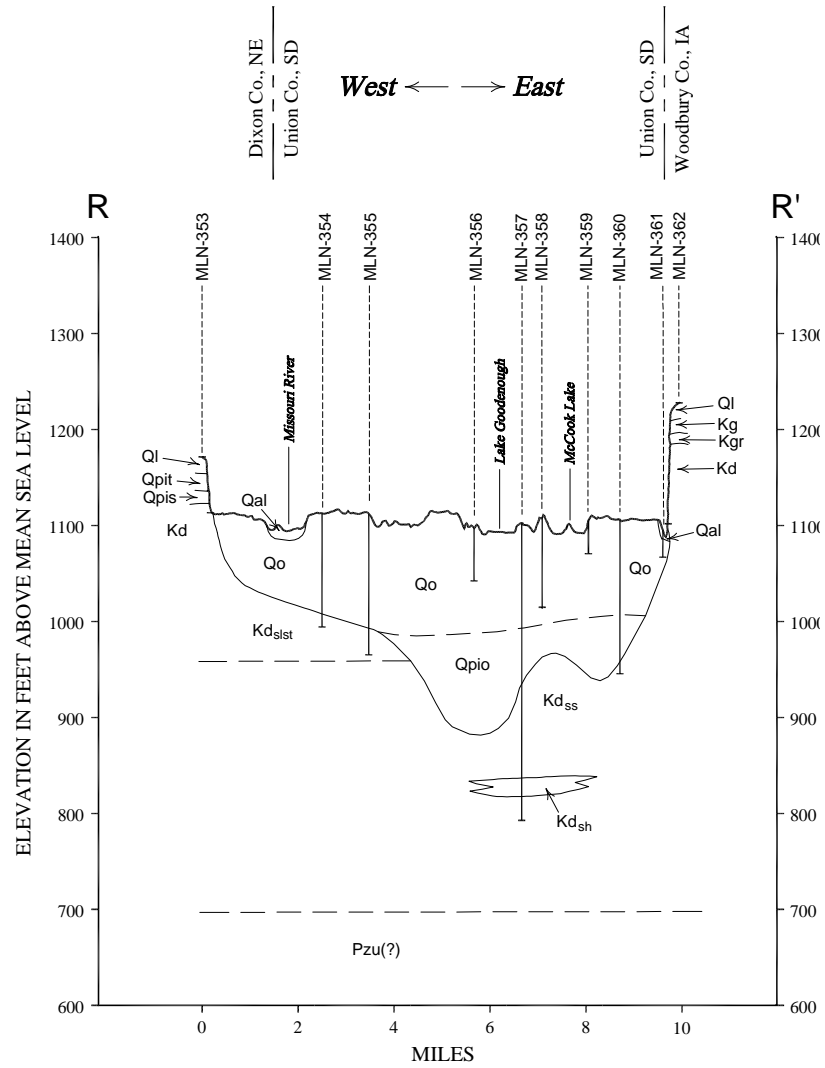
Clay Co., SD Union Co., SD	Union Co., SD Plymouth Co., IA
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# Geologic cross section R-R'

Vertical Exaggeration = 105.6X



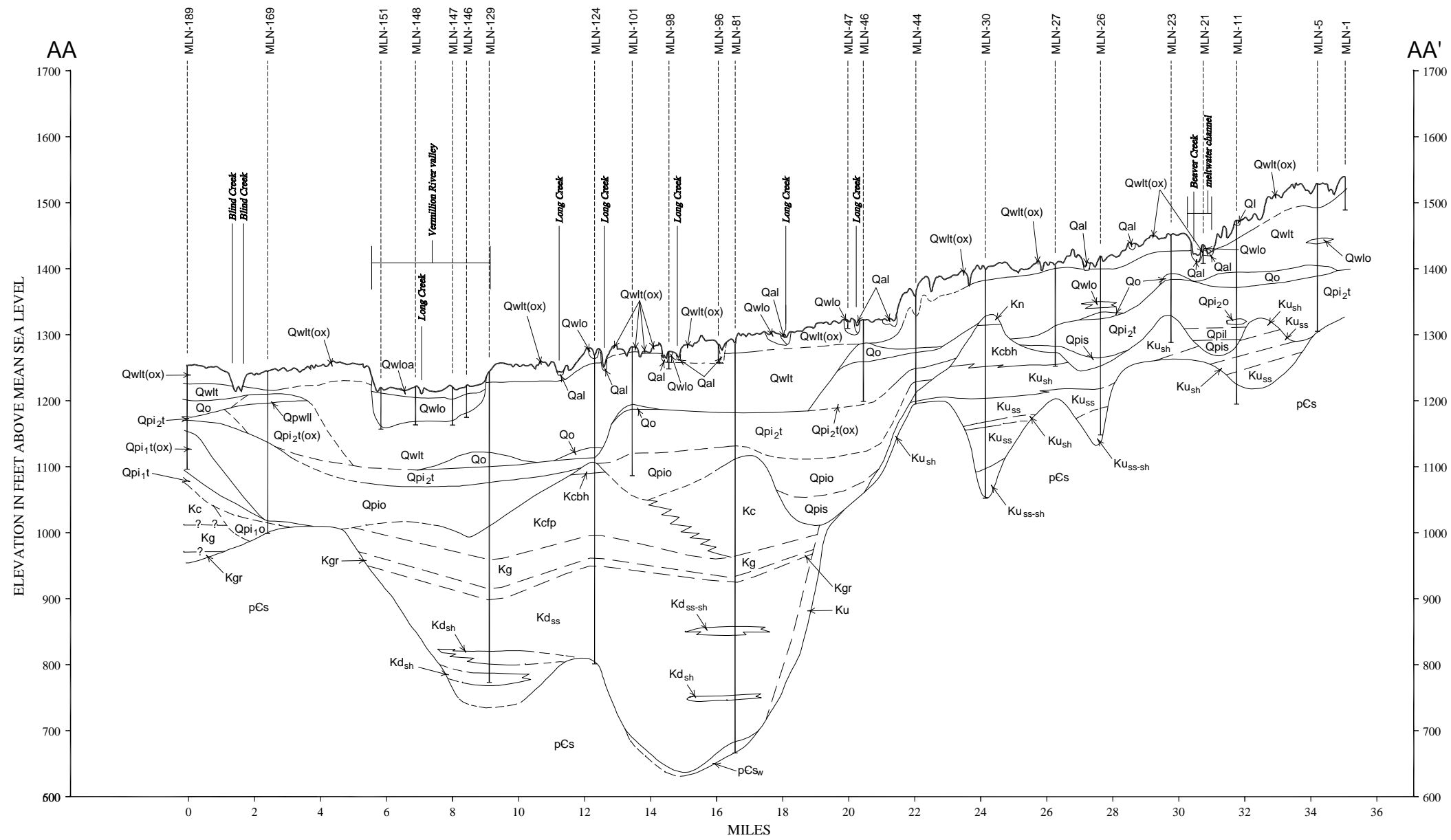
# Geologic cross section AA-AA'

Vertical Exaggeration = 105.6X

South ← → North

Lincoln Co., SD  
Turner Co., SD  
Turner Co., SD  
Lincoln Co., SD

Lincoln Co., SD  
Mimihaha Co., SD



# Geologic cross section BB-BB'

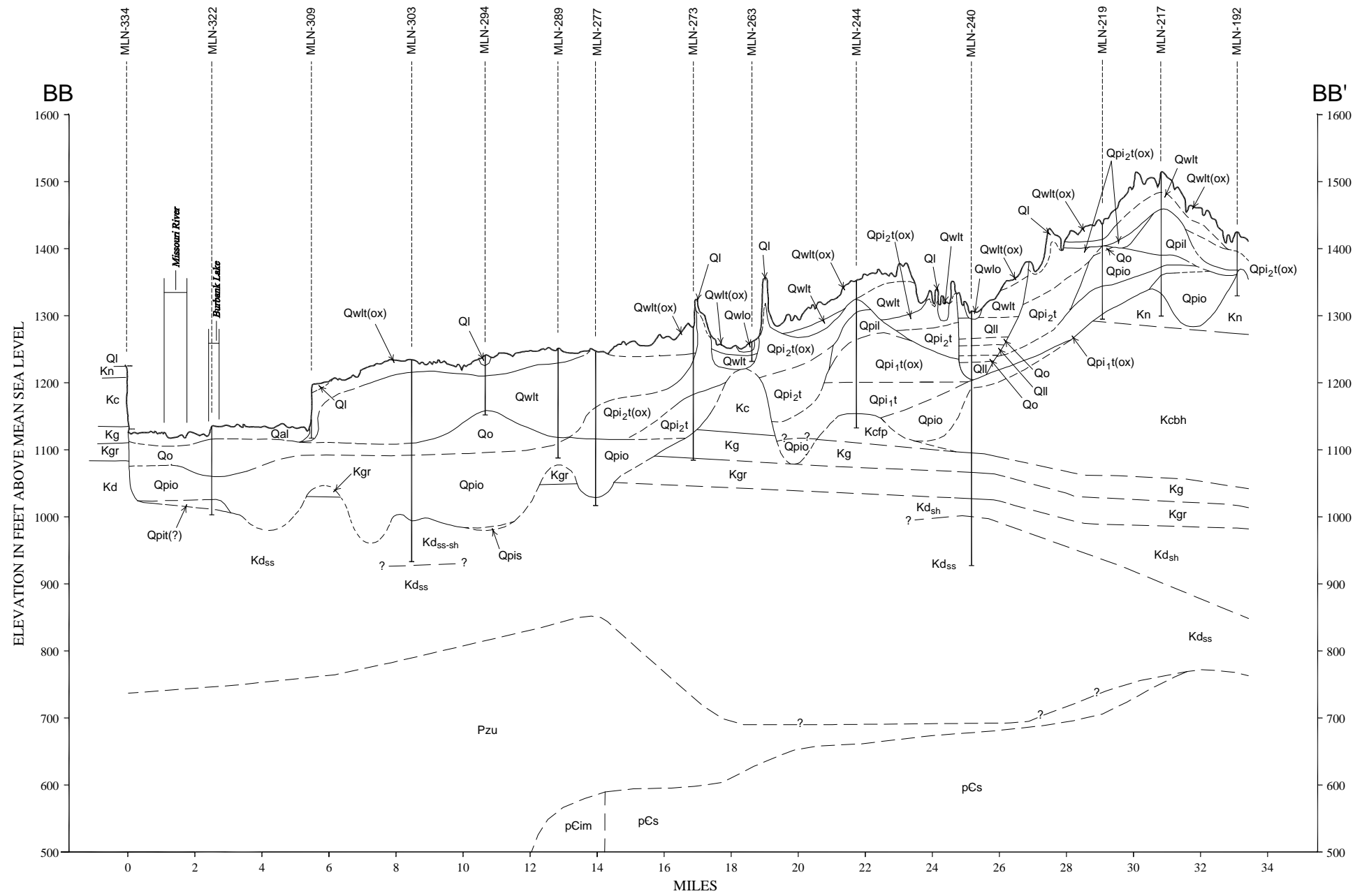
Vertical Exaggeration = 105.6X

South ← → North

Dixon Co., NE  
Union Co., SD

Union Co., SD  
Clay Co., SD  
Union Co., SD

Union Co., SD  
Lincoln Co., SD







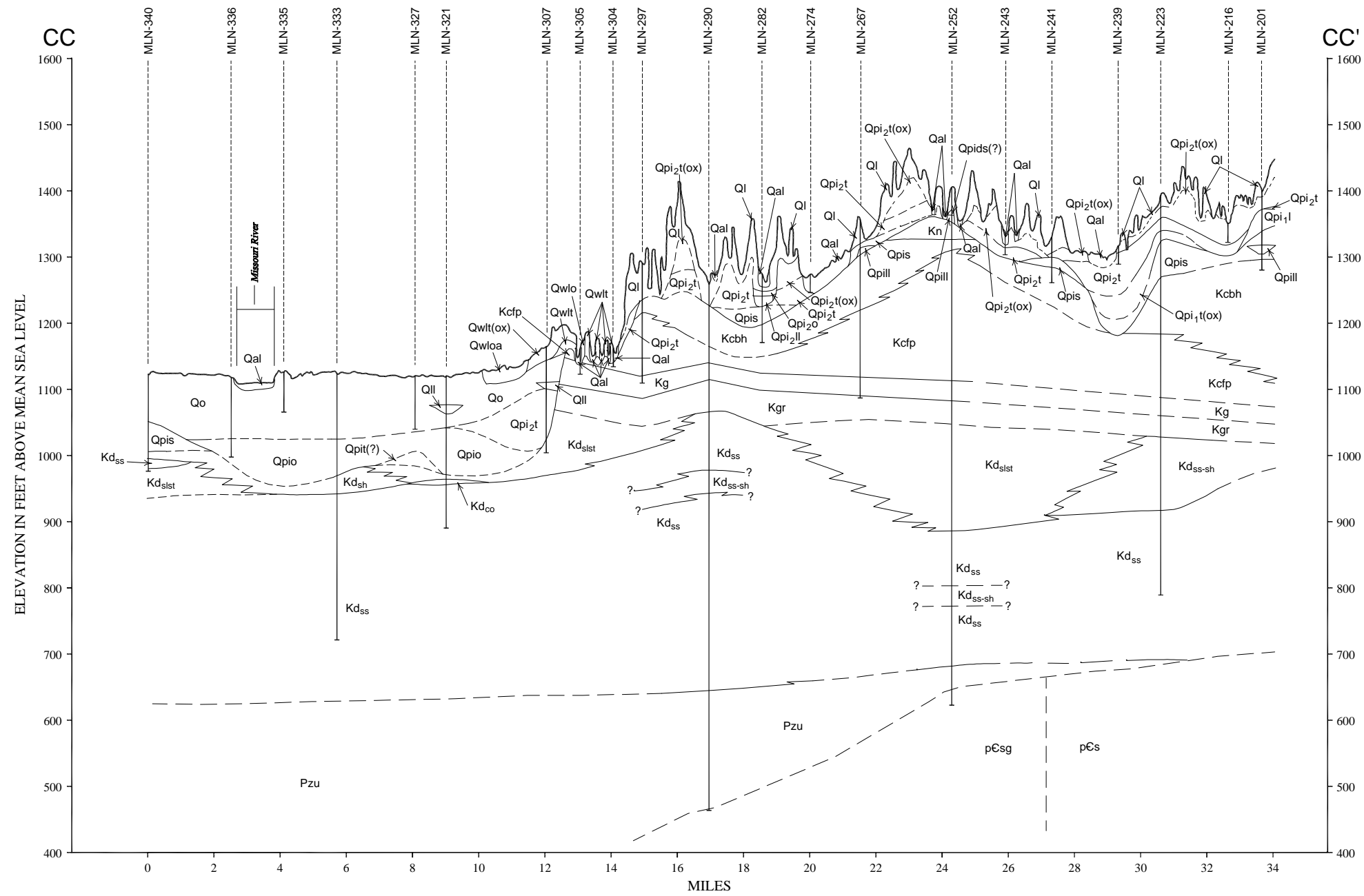
# Geologic cross section CC-CC'

Vertical Exaggeration = 105.6X

South ← → North

Dixon Co., NE  
Union Co., SD

Union Co., SD  
Lincoln Co., SD



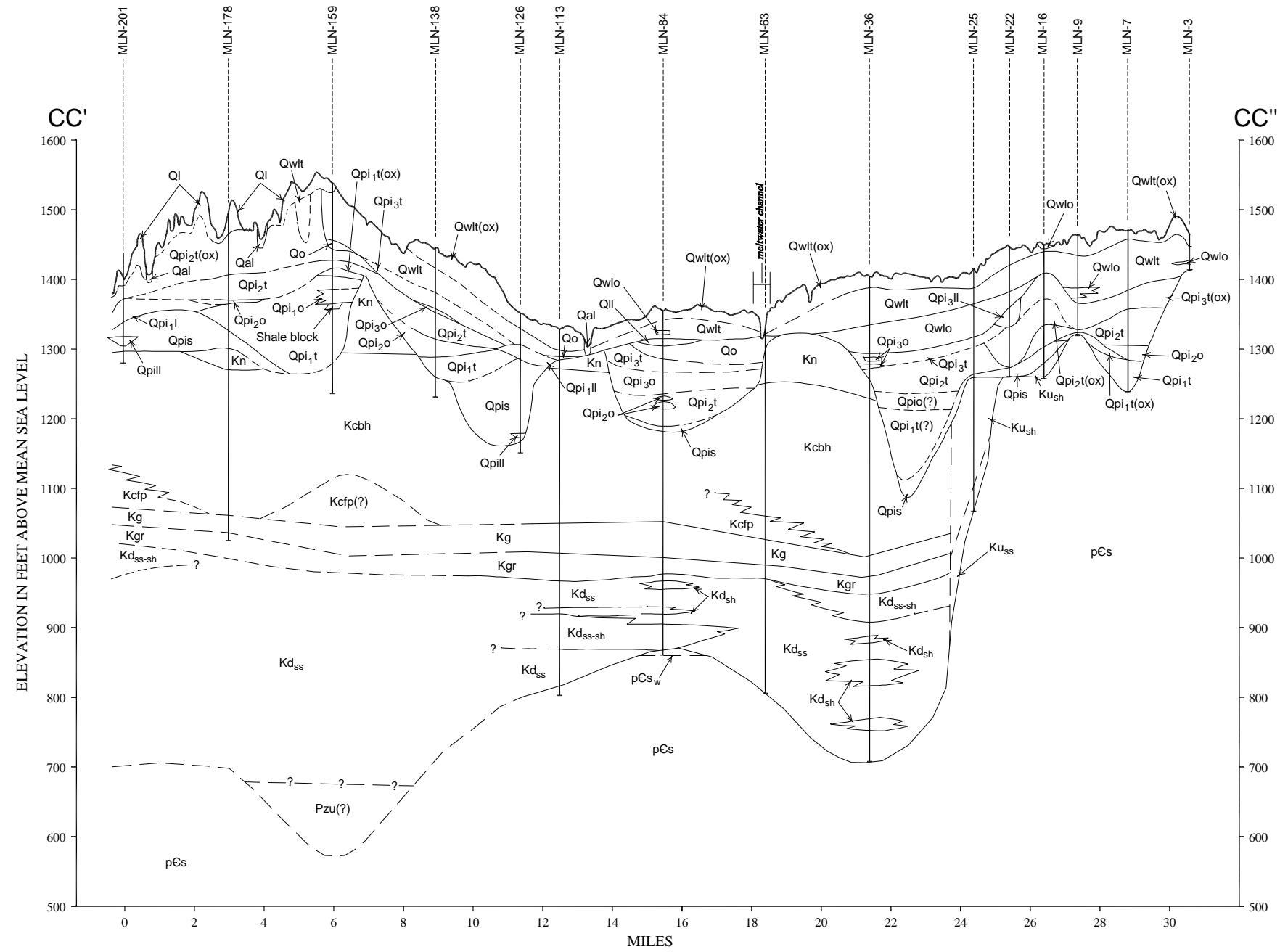
# Geologic cross section CC'-CC''

Vertical Exaggeration = 105.6X

South ← → North

Union Co., SD  
Lincoln Co., SD

Lincoln Co., SD  
Minnehaha Co., SD





# Geologic cross section DD'-DD''

Vertical Exaggeration = 105.6X

South ← → North

Union Co., SD  
Lincoln Co., SD

Lincoln Co., SD  
Minnehaha Co., SD

