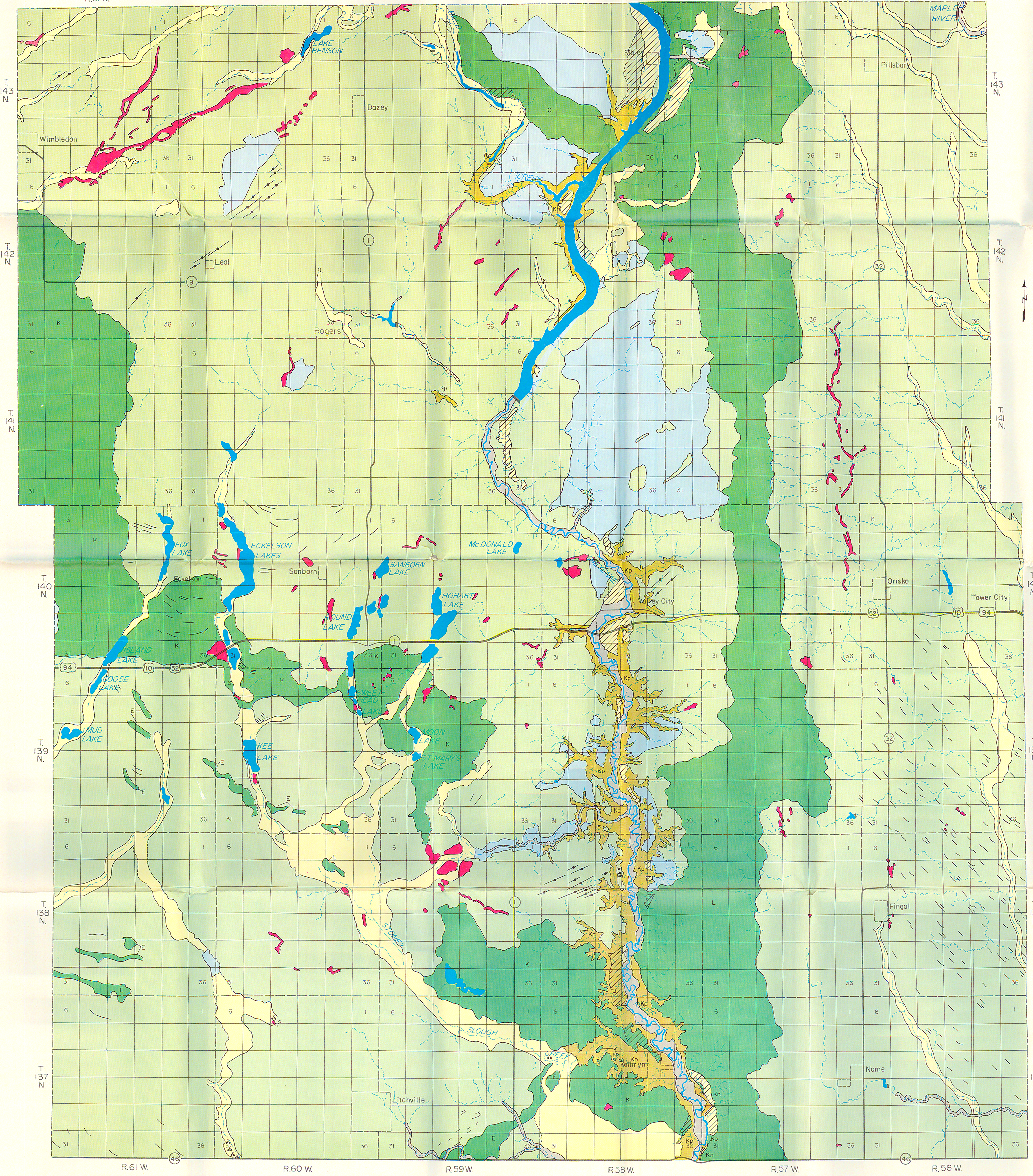
PREPARED BY THE UNITED STATES GEOLOGICAL SURVEY IN COOPERATION WITH THE
NORTH DAKOTA STATE WATER COMMISSION, NORTH DAKOTA GEOLOGICAL SURVEY,
AND BARNES COUNTY BOARD OF COMMISSIONERS



EXPLANATION

LANDFORMS

TILL LANDFORMS

GROUND MORAINE

Gently undulating topography, generally of low relief; composed mainly of till

E K C L

END MORAINE

Moderate to high relief topography having a distinct orientation; composed mainly of till. E, Eldridge; K, Kensal-Oakes; C, Cooperstown; L, Luverne

WASHBOARD MORAINES

Crests of closely spaced, low morainal ridges

STRATIFIED DRIFT LANDFORMS

LAKE PLAIN

Gently undulating to nearly flat accumulation of drift, chiefly silt and clay

KAMES, ESKERS, AND CREVASSE FILLINGS

Mounds of elongate ridges of drift, chiefly sand and gravel

OUTWASH

Gently undulating to nearly flat accumulation of drift, chiefly sand and gravel; often confined in channels

ALLUVIAL LANDFORMS

FLOOD PLAIN

Flat to rolling topography, generally low relief; composed mainly of silt and clay; locally includes terraces

COMPOSITE LANDFORMS

TERRACE REMNANT

Flat topography eroded on morainic or consolidated deposits or composed of outwash

DRUMLINS

Streamlined features consisting of till and stratified drift

GEOLOGIC UNITS

CRETACEOUS — Upper Cretaceous

Kp — PIERRE FORMATION

Gray to black shale with gray marl and numerous beds of bentonite

Kn — NIOBRARA FORMATION

Yellow-orange marl and calcareous shale

CONTACT

Dashed where approximate

Geology by T. E. Kelly (1), D. A. Block (2), and Q. F. Paulson (3)

(2)
(3) (1)

0 1 2 3 Miles
Scale

BASE PREPARED FROM NORTH DAKOTA HIGHWAY DEPARTMENT COUNTY HIGHWAY MAPS

PLATE 1. Landforms and geologic map of Barnes County, North Dakota.

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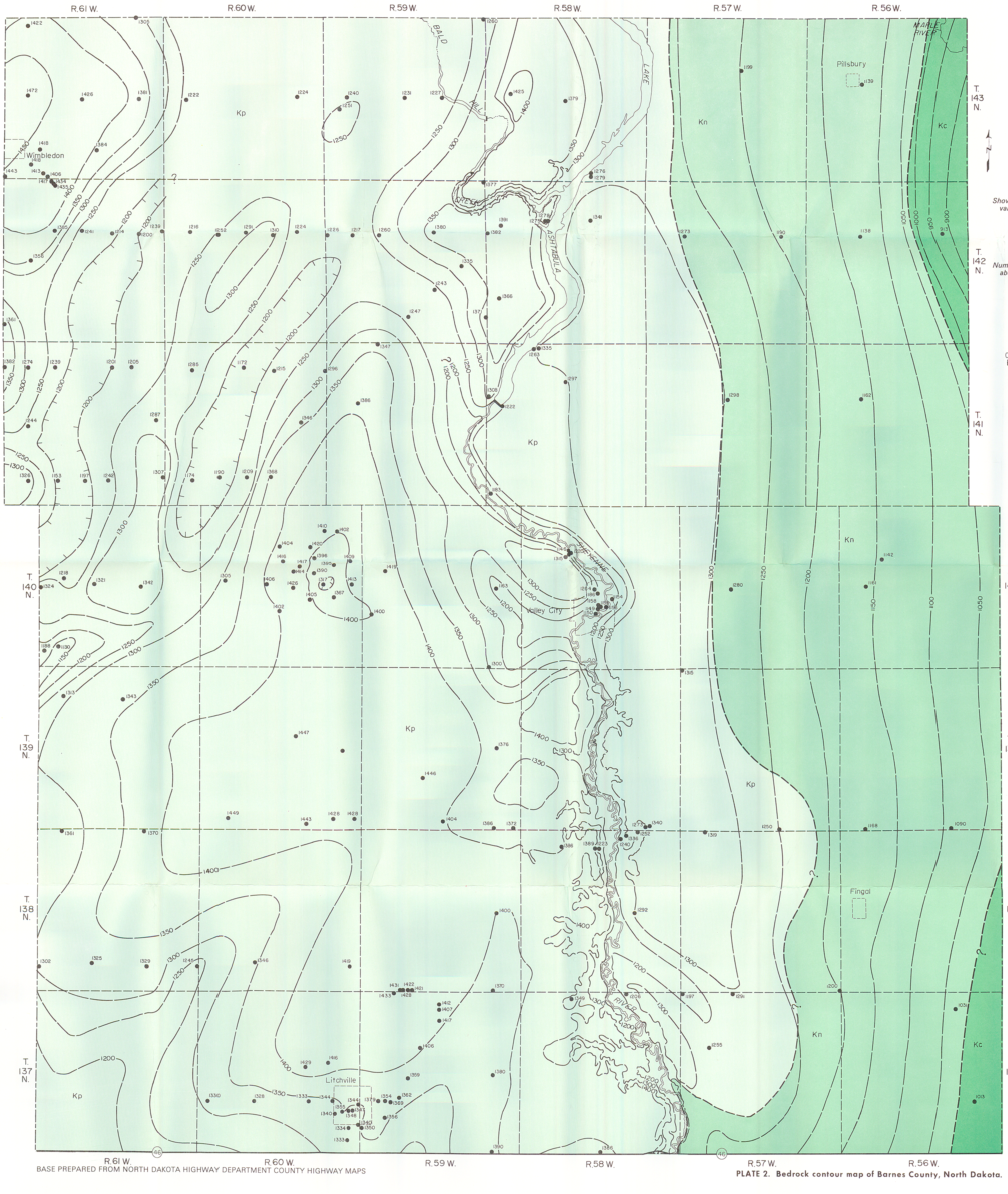

EXPLANATION

Kp — PIERRE FORMATION

Kn — NIOBRARA FORMATION

Kc — CARLILE FORMATION

Upper Cretaceous — CRETACEOUS

1300 — BEDROCK CONTOUR

Shows altitude of bedrock surface. Contour interval 50 feet. Datum is mean sea level.

1372 — TEST HOLE

Number is altitude of bedrock surface, in feet above mean sea level

GEOLOGIC CONTACT

0 1 2 3 4 5 Miles

Scale

BASE PREPARED FROM NORTH DAKOTA HIGHWAY DEPARTMENT COUNTY HIGHWAY MAPS

PLATE 2. Bedrock contour map of Barnes County, North Dakota.

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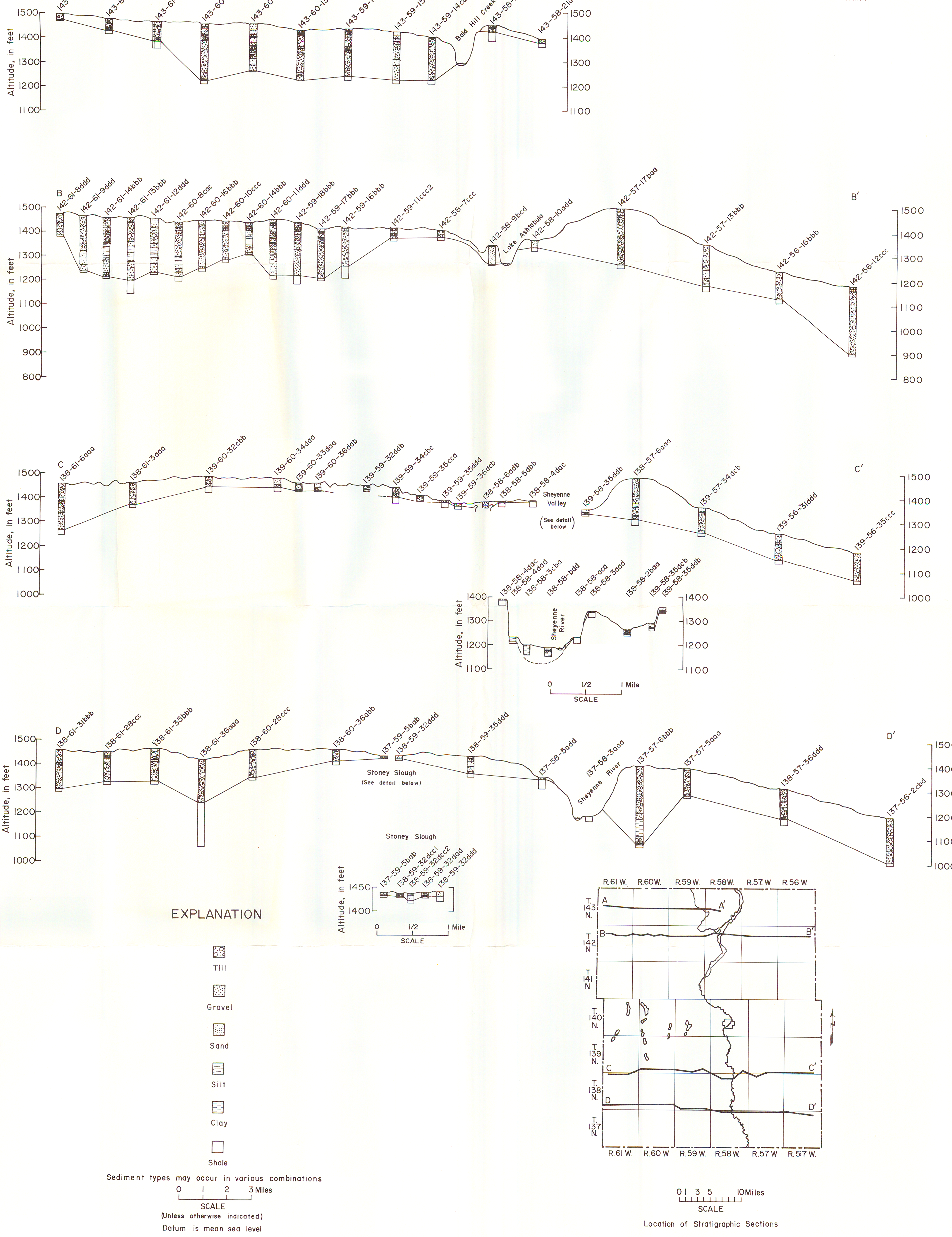

PLATE 3. STRATIGRAPHIC SECTIONS OF THE GLACIAL DRIFT AND ASSOCIATED DEPOSITS IN BARNES COUNTY, NORTH DAKOTA.

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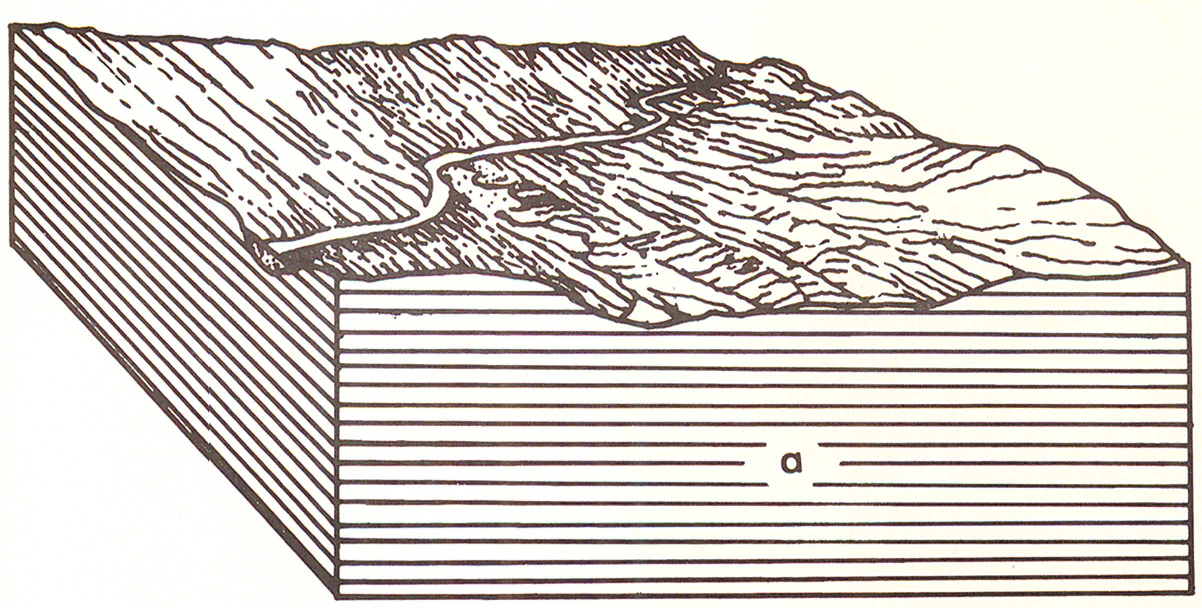
BULLETIN 43
COUNTY GROUND-WATER STUDIES 4
PART I



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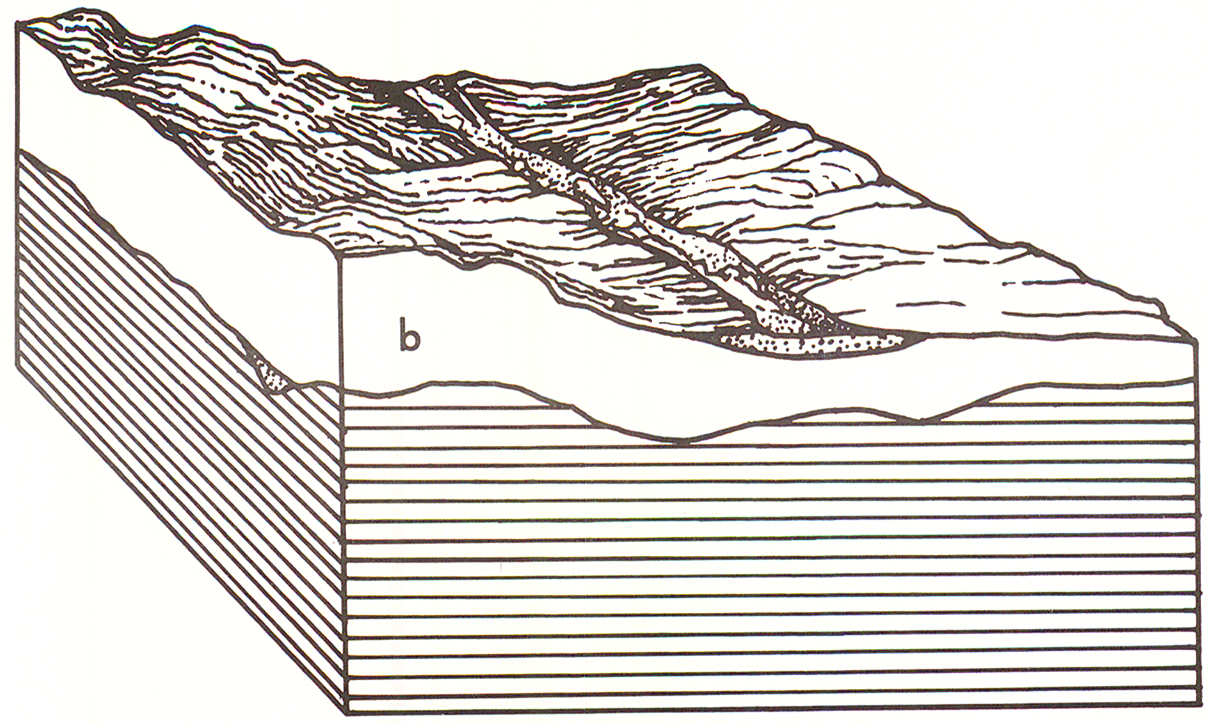

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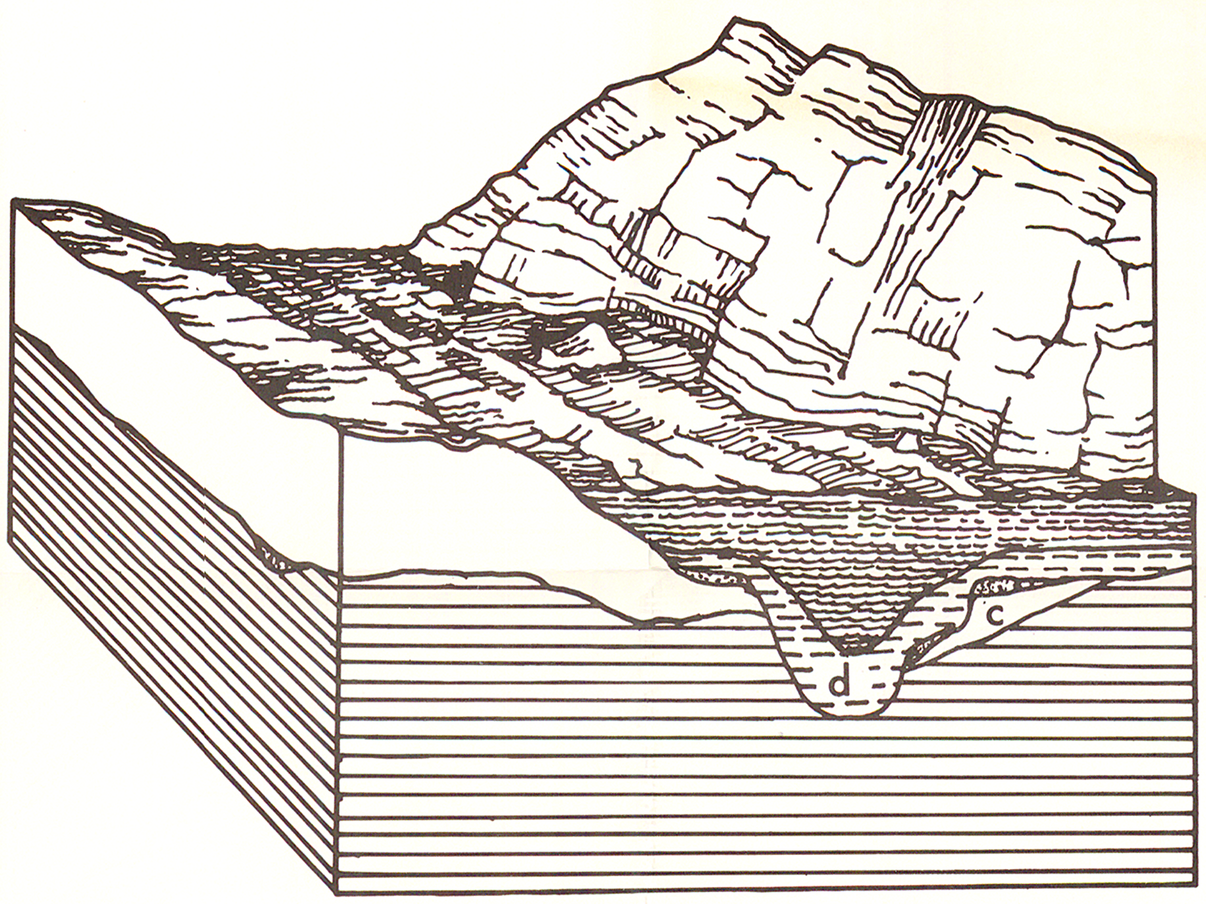

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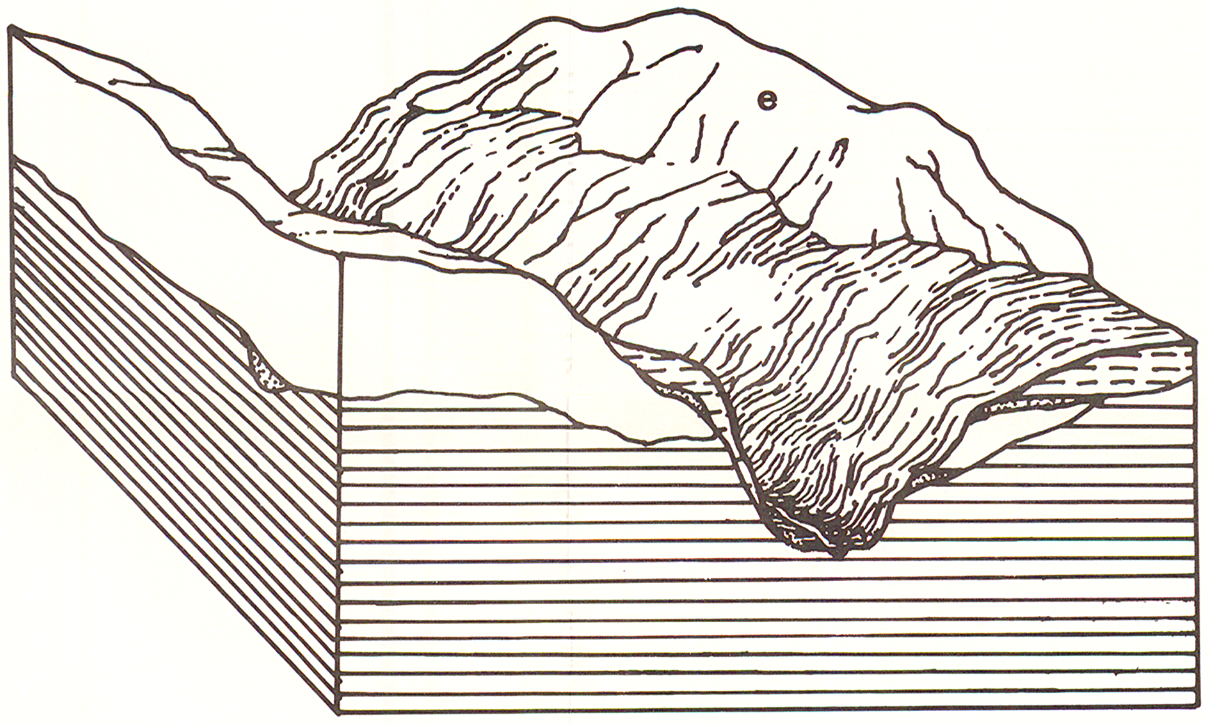

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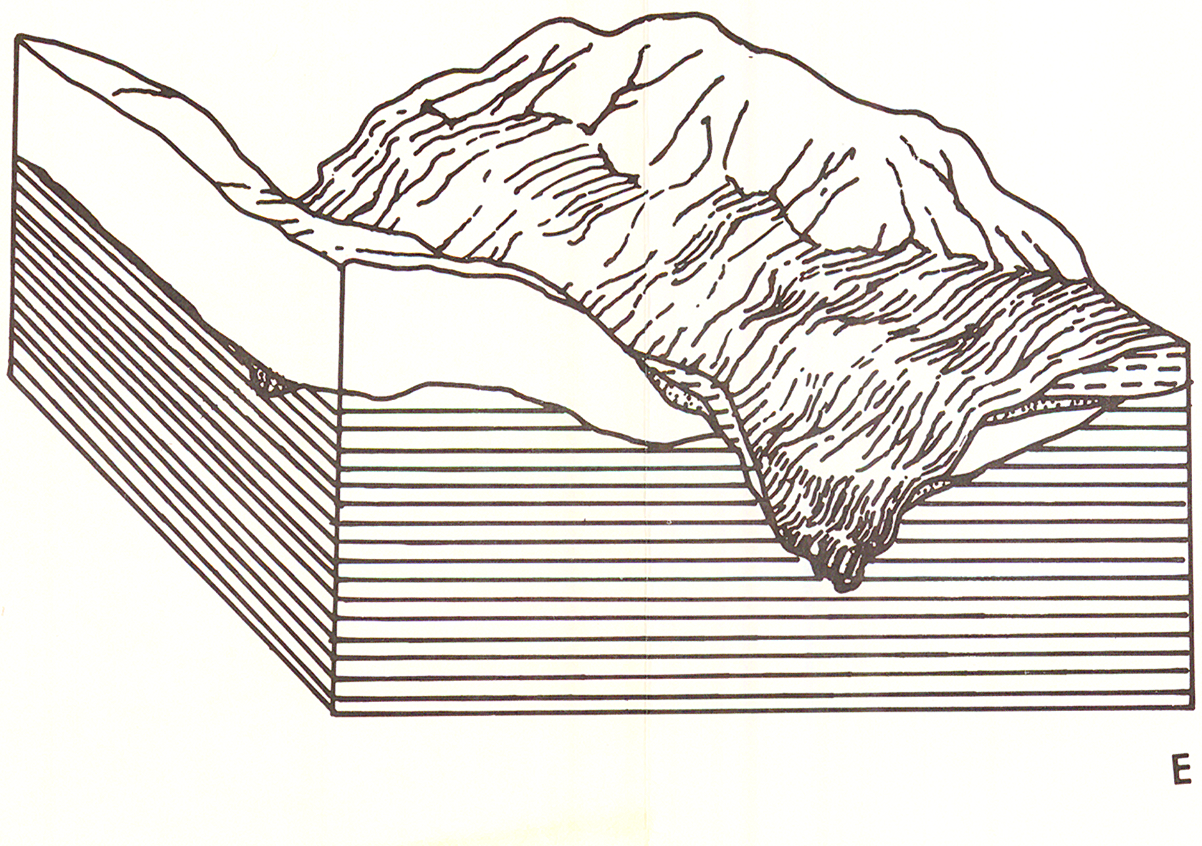

E

A. Preglacial streams flowed northeastward over a terrane eroded on Upper Cretaceous shale (a). B. Upon retreat of the glaciers from the Kensal-Oakes position, the Sheyenne River was established as a southward-flowing outwash channel east of the Kensal-Oakes end moraine (b). C. Terraces were formed during the Kensal-Oakes retreat and a lower terrace was eroded during deposition of the Cooperstown drift (c). They Sheyenne River was dammed when the glaciers advanced to the Luverne position resulting in the formation of a proglacial lake. Lacustrine deposits accumulated in the channel and blanketed the terraces (d). D. As the dam was breached, most of the lacustrine deposits were stripped from the valley. The Luverne end moraine marks the former position of the ice sheet (e). E. The Sheyenne River has entrenched itself since the draining of Lake Agassiz.

PLATE 4. BLOCK DIAGRAMS SHOWING THE EVOLUTION OF THE SHEYENNE RIVER VALLEY AND TERRACE DEVELOPMENT IN SOUTH-CENTRAL BARNES COUNTY, NORTH DAKOTA.